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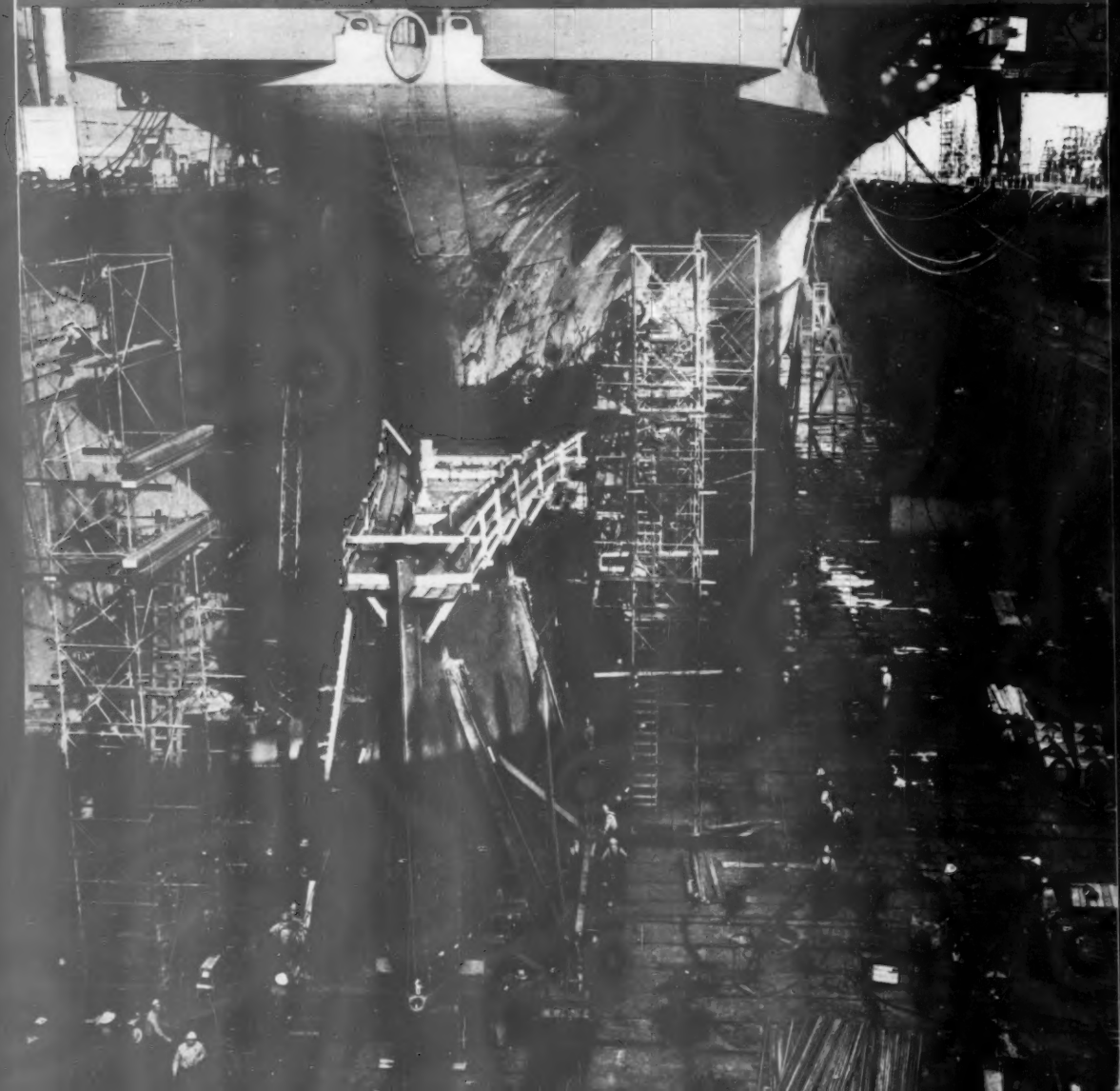
THE WELDING ENGINEER

AUGUST, 1932

Lined up in drydock, aircraft carrier USS Wasp is ready to receive the bow of her sister ship USS Saratoga. See page 24



Another JACKSON First!

New WELDING HELMET

with Outstanding New Features

One-piece molded plastic shell swings on adjustable friction pivots

To replace, cover glass slides out without disturbing the filter lens

Completely New Type of Helmet. The one-piece helmet shell is high-compression molded of laminated fabric, phenolic impregnated. This thermosetting material, by being more resistant to high heat and much less moisture absorbent, will hold its shape and weight far better than the ordinary vulcanized fibre. Its tough surface withstands weld spatter. It has been tested at 3000 volts against electrical conductivity. It is strong, smooth, easy to clean, and far more attractive in appearance.

New Lens Holder. The cover glass slides out from the front of the helmet, without disturbing the filter lens. There are no gaskets or other parts to come loose. Inner and outer metal lens frames are press-fitted and riveted to the shell. Both lens and cover glass are held securely but flexibly by steel springs. The filter lens is replaced from the inside, also without the use of tools.

Before shipment, all helmets are checked for light leakage against high powered light.

Headgear is of smooth plastic, easy to wash and sterilize. It is quickly adjusted (and then held firmly) to any head size. Oval in shape, it follows the natural outline of the head. A cork-padded sweatband, inexpensive to replace, is held by snap buttons. The shell is hinged from the sides of the headgear on manually adjustable friction pivots which allow easy raising and lowering, yet their concealed springs hold the helmet in any desired position.

JACKSON
PRODUCTS
WARREN · MICHIGAN

sold World-Wide . . . through Distributors and Dealers

HOBART

Just check Hobart Electric Drive Welders point for point against all other machines—and you'll soon know why they rate "first" with men who really know what welders should be able to do. Their rugged construction assures top performance, trouble-free service and long life . . . while such features as multi-range dual control and remote control make them the most easily operated welders on the market. Check coupon for details.

welders

Hobart Gas Drive Welders incorporate all the same time and cost saving features as the electric models—and, in addition, have an auxiliary power outlet. Built with plenty of extra reserve capacity, they give top performance at all times—yet can always stand the gaff, regardless of where you take them and how you treat them. Check coupon for details.

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Whatever your welding problem may be, there's a Hobart Electrode that's designed specifically to give you better, easier, faster welds at lower cost. Check coupon for details.

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Carefully selected to do the best job under every condition—Hobart Accessories step up welding efficiency, last longer. Check coupon for details.

HOBART BROTHERS CO., BOX U-82, TROY, OHIO

"One of the world's largest builders of arc welders"

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Check here for booklet "How to get better Welds" ☐

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Send me ☐ Welder Catalog ☐ Electrode Catalog ☐ Accessory Catalog

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FLOWLINE Welding Fittings—tees, ells, reducers, stub ends, and caps—are made and normally stocked in Schedules 5, 10, 40, and 80—sizes ½" through 12"—in stainless types 304, 316, 347; Monel, Nickel. All fittings are annealed, cleaned bright — stainless fittings are passivated — and marked with type of metal, heat number, size, schedule, and wall thickness.

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THE WELDING ENGINEER

A McGRAW-HILL PUBLICATION

VOLUME 37 NUMBER 8

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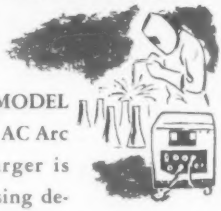
Mid-States MEETS THE DEMAND...

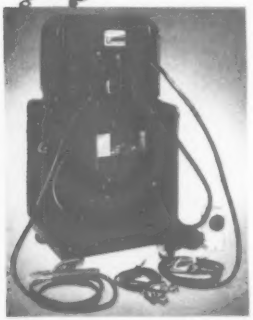
with a NEW COMBINATION AC ARC WELDER and BATTERY CHARGER!



The new MID-STATES MODEL No. 175-BC combination AC Arc Welder and Battery Charger is the answer to the increasing demand by repair shops, maintenance men and farm trade for an all-purpose, all-around heavy duty portable type welder. Re-connectable for 110 or 220 volt operation.

Model No. 175 shipped complete with accessories as illustrated

Model No. 175-BC BULLDOG has the same superior engineering design, top-quality material and precision workmanship that go into the larger models of the famous MID-STATES line. It carries the same 5 YEAR BURN-OUT PROOF GUARANTEE which covers all MID-STATES METAL ZIPPER WELDERS. The following specifications will show you why the new Model No. 175-BC BULLDOG will meet a wide variety of demands:



MISSING LINK High Frequency Arc Stabilizer can be used with the new Model No. 175-BC BULLDOG AC ARC WELDER, as illustrated.

Compare these outstanding performance features:

Amperage range—15 to 175
(Wide enough range to meet any farm, maintenance or repair shop requirement)

Rated output amperes—140

Arc voltage—25
(Easy arc starting and deep penetration)

Open circuit voltage—65

Power factor correction—75%
(Low line draw)

Duty cycle at rated amp. load—50%
(N E M A Standards—to meet heavy duty demands)

Duty cycle above rated amp. load—20% *(R E A Specifications)*

Primary amperage draw*, 220 volt lines—36

Primary amperage draw, 110 volt lines—72

K V A at rated output—7.9

Rod sizes handled—1/16" to 3/16"

Battery charging rate, D C amps.—6

*When shipped from the factory, the Model No. 175-BC BULLDOG Arc Welder is wired for 220 volt operation and has a 3 prong plug attached to the primary cable. For 110 volt operation, only intermittent use is recommended on properly wired and fused lines.

Write for descriptive literature covering the new Model No. 175-BC BULLDOG WELDER and the complete MID-STATES LINE

Model 175, without battery charging circuit is available at lower list price

Mid-States WELDER MFG. CO.

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NEWS FROM WASHINGTON

Nickel and Cobalt Allotted to U. S.

A TOTAL of 36,580 metric tons of nickel and 2,475 tons of cobalt have been allotted to 38 nations by the International Materials Conference, a 28-nation group that doles out scarce materials on a voluntary basis.

The amounts allocated are said to constitute a three-month supply of cobalt and nickel. The United States received the largest allotments: 24,626 tons of nickel and 1,583 tons of cobalt. Great Britain received 5,428 tons of nickel and 360 tons of cobalt; France 1,764 tons of nickel and 111 tons of cobalt; Germany 1,378.9 tons of nickel and 147 tons of cobalt.

The United States reserves the right to purchase any metals that are allotted but not taken by member nations of the group. Conditionally, our government has accepted proposals of the International Materials Conference for the allocation of 405,756 tons of copper, 2,574 tons of tungsten and 4,540 tons of molybdenum. A sour note in the harmony of the proceedings, however, was struck by Henry A. Fowler, Defense Production Administrator. He said:

"Unless these conditions are met and satisfactory arrangements are made in conformity with the requirements of the New Defense Production Act recently enacted, the United States will not finally accept the IMC recommendations."

Congress recently banned the use of State Department funds to help finance the conference on the grounds that it is hampering American business.

Shea New Chief Industrial Heating

LESTER A. SHEA, on leave of absence as general sales manager of Lindberg Engineeering Co., Chicago, has been selected for the post of chief, Industrial Heating Equipment Section, Metalworking Equipment Division of the National Production Authority. He brings 27 years of experience in the industrial heat-treating field to his new assignment.

Lester A. Shea

Shea joined Lindberg Engineering Co. in 1937. He is on the executive staff and design committee and serves directly as coördinator for the various divisions covering heat-treating furnaces, melting furnaces, low-frequency melting furnaces, high-frequency induction equipment, laboratory furnaces, air-hydraulic equipment, transformers and automotive accessories.

He is a member of American Society for Metals, American Foundry Society, Sales Executive Club of Chicago and American Institute for Management. He served five years on the executive board of the American Society for Metals, Chicago Chapter, two of which were as its secretary-treasurer.

Contracts to Expand Columbium Production

A FIVE-YEAR contract to expand production of columbium and tantalum was recently negotiated by the Defense Materials Procurement Agency with the Fansteel Metallurgical Corp., North Chicago, Ill. The company has agreed to spend an estimated $455,280 of its own money to expand plant facilities. This will double present output of potassium tantalum fluoride, the basis of tantalum metal.

Browning Assumes Double Duties

WILLIAM B. BROWNING chief of the Welding Equipment Section, National Production Authority, Department of Commerce, has assumed the duties of chief of the Industrial Supplies Branch, Metal Working Division, NPA effective July 15. He will also continue as chief of the Welding Equipment Section, where he has done an excellent job.

Where to Get Dope on Navy Subcontracting

AN INFORMATION booklet for small manufacturers who are seeking subcontracts with Navy defense contractors has been issued by the Office of Naval Material.

This booklet tells business men where to look for contract opportunities and summarizes steps to take in getting such orders. Included is a state-by-state directory of the Navy's major prime contractors. Copies are available at all Navy purchasing and inspection offices.

Federal Subsidy for Cryolite Buying

DEPARTMENT of Commerce has announced the purchase of 40,000 tons of synthetic cryolite, delivery to be taken at the rate of 10,000 tons annually. The cryolite, purchased from the Aluminum Ore Co., will be resold to Reynolds Aluminum Co. and Kaiser Aluminum and Chemical Corp.

The federal program also includes the subsidizing of additional quantities of natural cryolite brought from Greenland by the Pennsylvania Salt Co., the only national processor.

NEWS FROM WASHINGTON (Continued from page 5)

Steel Strike Causes Scrap Surplus

OWING to the steel strike, auto wreckers and scrap dealers are left holding large quantities of scrap. The mills say they will get around to using it but are not happy with the present ceiling price, including the F.O.B. shipping point charges they have to pay.

Automobile wrecking yards scrapped 649,621 trucks and 3,711,820 pleasure cars during the 1951 fiscal year. The total is a 150% greater number than the total of trucks and cars wrecked in 1950. Coöperation of the wreckers has been whole hearted and has brought excellent results.

The mills claim that a lot of scrap they have received has not been properly graded. In one instance, the Office of Price Stabilization sued a firm for alleged sales of steel scrap to a steel mill in the form of large bundles in which OPS claimed were hidden bags of sand and foreign material.

NPA said the "surplus" could be changed to a widespread shortage "overnight." The scrap shortage is really worldwide. However, we need the scrap here in this country, and it will not be shipped overseas.

Nickel a Must for U.S. Tanks

A LOW nickel content in tank armor cost the Germans the war with Russia, military spokesmen say. Hence, nickel is an absolute must for the U.S. tank program. And until ferritic or low-hydrogen electrodes are proved satisfactory for all classes of armor welding, nickel-bearing stainless electrodes will have to be used.

Most severe service for tank armor is under low-temperature conditions, as the Germans found out during the Russian winters. The German armor did not contain any nickel and was not designed for subzero temperatures. The armor simply shattered when hit by shell fire.

It is a complicated task to build equipment for the military because design must be made for the most severe service life that will be encountered. And conditions and end use may be varied all over the globe.

Tin Conservation Must Continue

TIN must be continued on a conservation basis, says NPA, because of uncertainty that the present supply is adequate in an emergency. Changes could occur in the tin supply that might necessitate a quick tightening of controls.

Industry has recommended revisions in Order M-8 allowing slight changes upwards in tin content of solders for general use and also recommended additional changes to allow the alloying of 40% tin in solder for any end use without certification. However, anything approaching modification of control is not foreseeable at the present time, state NPA men.

Controlled Materials on Standby Basis

NATIONAL Production Authority plans to decrease the operating appropriation for the Controlled Materials Program and gradually go on a standby basis. The decontrol of copper and aluminum will cut the number of employees needed. In some instances, personnel will be transferred to other jobs; departments will be consolidated, and replacements will not be made for any employees leaving.

The steel strike will have a tendency to continue controls and may reverse the present trend entirely. Next on the list for possible work stoppage is the aluminum industry, with copper to follow.

Lost Steel to Hit Electrode Production

ELECTRODE production will feel the effects of the steel strike long after the strike is over, prophesy Department of Commerce officials. Here's the chain of gloomy reasoning:

By July 15, we had lost 14 million tons of steel production. Of this amount, 2% or 280,000 tons would normally have gone into welding electrodes. A lag of at least two weeks must normally follow any steel mill shutdown before production is back to normal. To this must be added the time element for shipping wire to electrode makers, coating it and shipping it out again.

By July 15, some manufacturers were already completely out of wire. Some simply shut down; some closed for "vacations" and will not reopen until wire is available. On July 15 also, 75% of the arc-welder manufacturing industry was closed down for lack of all types of steel. The shortage in arc welders is expected to be manifest by August 15.

New Processes Boost Aluminum Tube Output

PRESENT effort in the manufacture of aluminum tubing is to find a cheaper and faster process than extrusion, one which will be acceptable for military and civilian use. In this direction, Defense Production Administration announces that two processes are being developed for making welded tubing from aluminum sheet. These are: (1) high-frequency induction welding and (2) the "cold welding" process in which pressure is used without heat to effect the weld.

Turning to the raw materials for aluminum, DPA reveals that 60% of our 1951 supply of bauxite was imported. Domestic and workable known deposits of the ore are running out even though, oddly enough, aluminum is the most abundant metallic element in the earth's crust.

New sources being developed are in Jamaica, Haiti and Santo Domingo. New methods are making it possible to use the bauxite ores found in the Caribbean area.

The planned increase in bauxite imports, said DPA, may mean that by 1953 the imported ore will be nearly 80% of the total supply available to this country. Domestic production in 1951 was about 1,849,000 tons, from mines in Arkansas, Alabama and Georgia.

the new Koolite* torch...

we sold, to date, 102,396 of this new model torch... and of a prior model over 150,000

it uses either oxygen or compressed air with any of the useable fuel gases—city and natural gas, propane and butane or acetylene.

just select the proper tip type and sizes

it gives you a needle point or brush like flame

This new Koolite Torch offers many advantages — it is always cool to the touch because of its smooth, long lasting plastic handle. The blowpipe is designed to be used with either compressed air or oxygen and any of the useable fuel gases. It will produce a brush like or a needle point flame. The three tips are easily exchangeable. Clear operating instructions are on the box as is also an understandable replacement parts list. You will like the reasonable price and the fine performance of this torch. It is made by one of the oldest welding equipment companies.

*The word "Koolite" is a registered trade-mark.

Price - - - with three tips and wrench only $9.50

Made by National SINCE 1910 **WELDING EQUIPMENT CO.,** San Francisco 5, California

821

Gives Welders
Lightweight Comfort
as well as Protection!

Head and Eye Protection Equipment

AO 666
WELDING
HELMET

This extremely lightweight fibre helmet has no projections or obstructions on the outside to interfere with work in close quarters. It has two positive stop points, one holding helmet in position on face, the other maintaining helmet in "off" position. The headgear has slide adjustment, enabling welder to fit helmet comfortably. None of rivets in headgear are in direct contact with head. Metal glass holder permits plates to be slipped in and out quickly, easily. Genuine leather sweatband for added comfort. Regularly fitted with Noviweld or Filterweld plates. Protected from pitting by easily replaceable cover plates available at slight extra cost. Your nearest AO Safety Products Representative can supply you.

AO's Industrial Vision Program increases production, decreases accidents. Write today for free booklet "Improved Industrial Vision."

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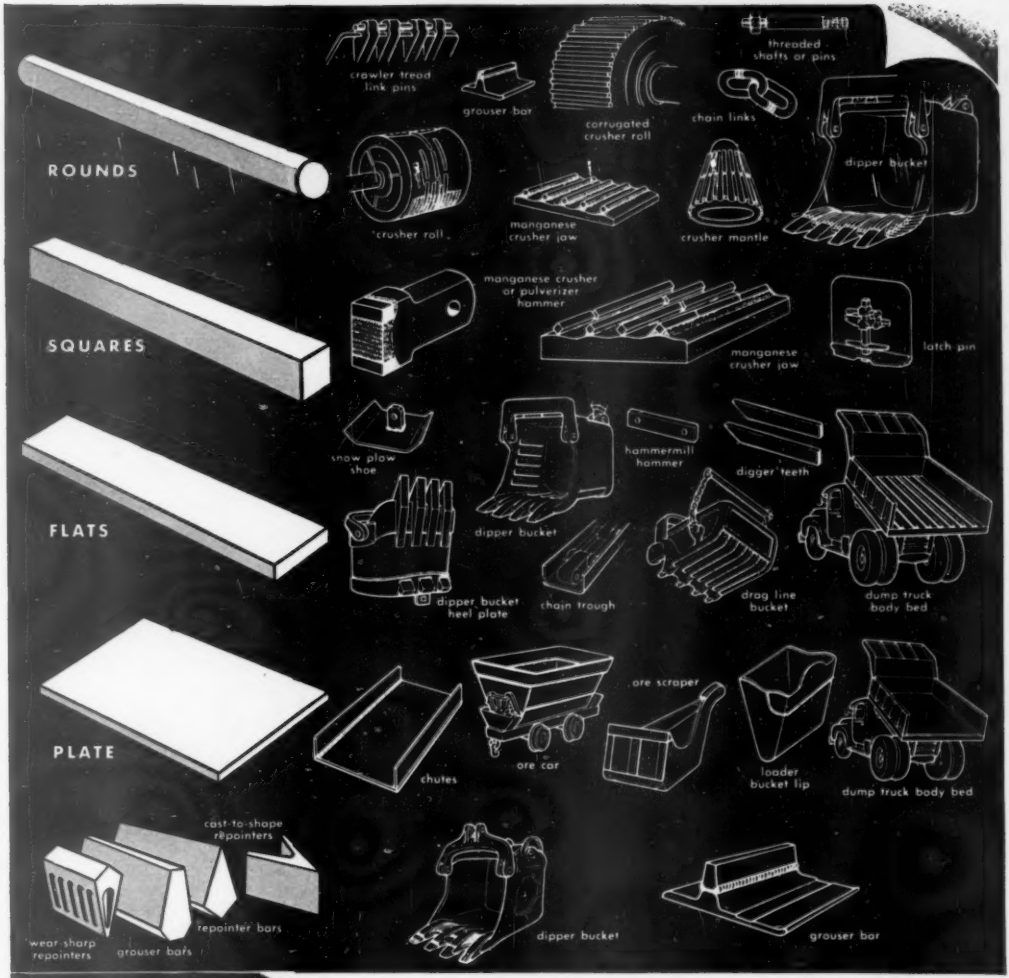

Amsco Welding Rods and Electrodes For repair welding of manganese steel shapes to worn equipment, American Manganese Steel Electrodes retain their toughness and give real operating savings.

Amscoating with Amsco Hardfacing Rods increases service life . . . reduces shutdowns.

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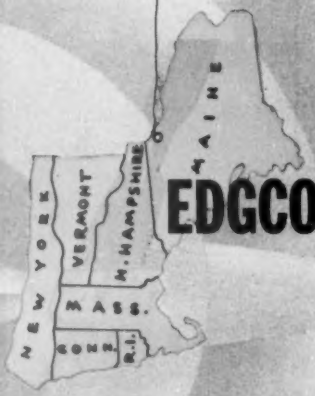

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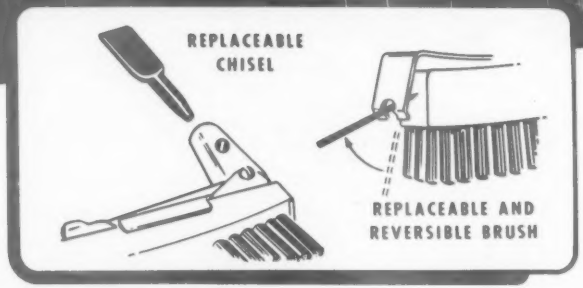
THE MOST PRACTICAL WELD CLEANING TOOL EVER DESIGNED!



Model B-1
(With wood handle, B-1W)

Atlas "RE-BIT DUAL TOOL"

● Experience real economy with this tool that requires replacement of worn parts only! The "Re-bit" chisel can be set at any angle, has a wider edge and narrower cross section, gets into corners and pockets better, affords better vision. "Re-bit" is easier to sharpen, lasts longer . . . Ask your welding supply dealer for information on all 27 Atlas models.

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707 E. LEWISTON AVENUE FERNDALE 20, (DETROIT) MICH.

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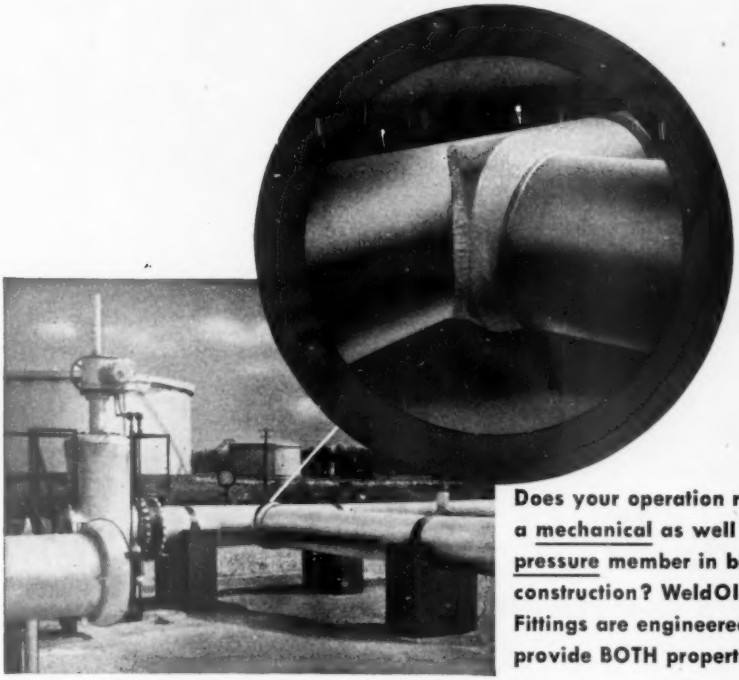
FOR YOUR BRANCH CONNECTIONS



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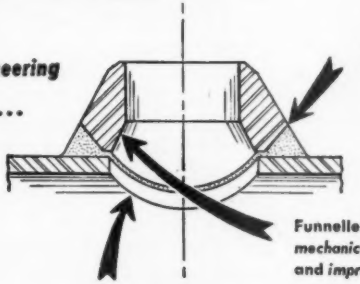
Specify Bonney WeldOlet Welding Fittings to Insure Permanent Strength



Reinforcement where both the mechanical and internal *stresses are most severe*

Funnelled to relieve *mechanical stress concentrations* and *improve fluid flow*

Shaped and beveled for *clean, quick and economical installation*

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THESE 5 G-E FEATURES TO HELP YOU

Generous overtravel makes accurate current settings easy.

1. **SMOOTH, FAST WELDS** are simple to make with the steady arc because arc-stabilizing capacitors eliminate popouts.

2. **ACCURATE CURRENT SETTINGS** are easy to make, especially in the low current range.

3. **OPERATING COST IS REDUCED** because less power is used when idling.

4. **INSTANT STARTING** without scratching saves operator's time. The hotstart automatically provides the right amount of starting boost for every setting.

5. **LONG COIL LIFE** is assured with Class H silicone insulation, exclusive with G.E.

TO GET YOUR SHARE of these big welding benefits, call or see your nearest authorized G-E welding distributor! His name is listed in the yellow pages of your telephone directory. Look for General Electric under "Welding Equipment."

Section C711-24, General Electric Company, Schenectady 5, N. Y.

Please send me immediately information on a typical G-E a-c welder, GEC-750.

Name .....

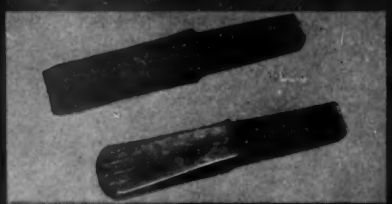
Company .....

Address .....

City ..... **State** .....

GENERAL ELECTRIC

ANY equipment parts that are subject to rough impact or severe abrasion are likely applications for *Wear-Arc* hard facing. Write for Bulletin 5651 for application information and welding procedures.



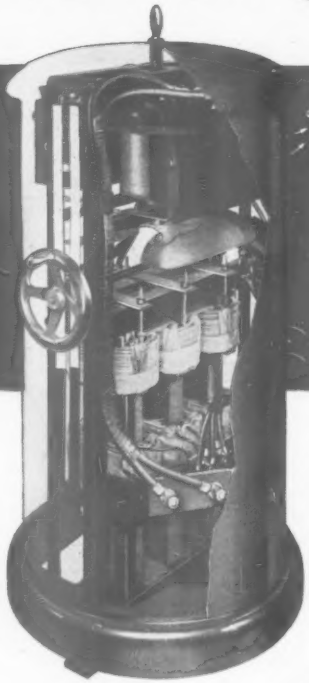
Alloy Rods Co.

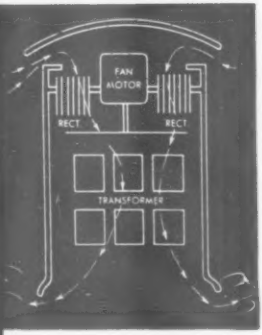
ALLOY RODS COMPANY
No Finer Electrodes Made . . . Anywhere
YORK, PENNSYLVANIA

AR-5

The only rectifier welder designed to eliminate stack failure!

A.O.SMITH D.C. WELDER





Location of rectifier stacks in the flow of cool, clean air entering the top of the A. O. Smith D.C. Welder assures positive cooling of these most critical parts.

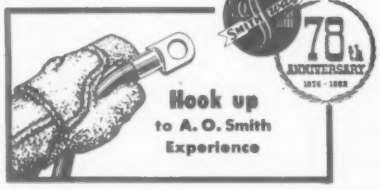
Wind tunnel design, proved for more than a decade in A. O. Smith Heavy Duty Welders, blasts cool air down and over rectifier stacks. This prevents stack failure. In addition, clean rectifier stacks and clean glass-insulated heavy copper transformer coils are assured. Maintenance down-time is thus avoided.

This marked advance over conventional rectifier-type welders solves overheating problems, ends limitations on duty, avoids introduction of floor dirt and eliminates rectifier stack failure.

Other refinements provide effortless amperage control, universal application and economical operation. They, too, are exclusive in this advanced design, rectifier-type, D.C. Welder.

Sectional view of the new A. O. Smith Rectifier-type D.C. Welder and diagramatic drawing show ideal location of stacks and circulation of high-velocity air through the welder.

Available in 200-, 300-, and 400-amp. models.



A.O.Smith
WELDING PRODUCTS

Made by Welders . . . for Welders

For complete information, write direct to: A. O. Smith Corporation, Welding Products Division, Dept. WE-852, Milwaukee 1, Wisconsin

Welding Info-Aids

201 WELDING ANALYZER — The Brush Development Co., Cleveland 14. Single-sheet bulletin describes the new Brush welding analyzer Model BL-213 for direct recording of the variables in three-phase spot, projection and seam welding. Components and specifications are listed on the reverse side to give a complete picture of the possibilities of the instrument.

202 R-W CATALOG — Multi-Hydromatic Welding and Manufacturing Co., East Detroit, Mich. 48-page catalog describes resistance welding parts, machines, fixtures and presses for spot, projection, portable and multiple transformer welders. Many pictures and much data are included.

203 WELDING FITTING ERRATA—Tube Turns Inc., Louisville 1, Ky. 8-page "Addenda Errata" booklet with minor revisions for Tube Turns Catalog No. 211 brings the latter up to date. Code changes plus new design information have made necessary a new 10-page "Design Properties of Pipe" table (in booklet form) to supersede Table 2 in Catalog 211, also available.

204 METALS CLEANING — Turco Products, Inc., Los Angeles 54. 14-page booklet A-53 gives a handy review of Turco products for the metal-working industry including compounds for cleaning, processing, aids to processing, specialty products, flaw-detection processes and plant maintenance. Conversion tables, a phosphating reference chart, and data on saturated steam and water heating are also supplied.

205 SURFACE RESISTANCE—Weltronic Co., Detroit 19. Bulletin No. 40 tells about the Weltronic surface resistance meter that tells directly in microhms the effectiveness of pre-weld cleaning of aluminum and other metal sheets. Also described are components, mountings, power sources and characteristics.

206 VERTICAL AIR-GRINDER—Roto Tool Co., Cleveland 12. 6-page bulletin tells about two new vertical weld grinding tools, Model B-35 for heavy-duty and Model B-12 for lighter tasks. Diagrams show such features as special end plates, adjustable handle, automatic oiler and magnesium castings.

207 LEATHER CLOTHING — John Tillman & Co., Long Beach 10, Calif. 10-page catalog gives a complete rundown on welder's leather gloves, mittens, strap sleeves, aprons, jackets, overalls, rod holders, head gear pads, shoe protectors, pocket shields, lighter holders, knee pads and work gloves. Pictures illustrate descriptions.

CARDS NOT GOOD AFTER NOV. 1, 1952

TO OBTAIN: (1) manufacturer's catalog or bulletin described on this page; information on (2) a new product item or (3) an advertised product, use the card sections printed below. Insert number of catalog or new products item or page number of advertised product (add initials of the advertiser if more than one ad appears on the page). THE WELDING ENGINEER will ask manufacturers to send the information requested.

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Company Rex Mfg. Co.
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Chicago 16, Ill. Title Engineer
THE WELDING ENGINEER

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CHICAGO 11, ILL.

208 INDUCTION HEATER — Lepel High Frequency Laboratories, Inc., Woodside 77, New York City. Bulletins tell about 2 kw to 100 kw high frequency heating units for brazing, hardening, annealing, melting and soldering. Such aspects as power input, protective devices, meters, controls and water requirements are explained.

209 MANGANESE ELECTRODES — The McKay Co., Pittsburgh 22. 4-page technical bulletin No. 8 describes the operation and applications of "Frogalloy M" and "Frogalloy C" electrodes for build-up and repair of high-manganese and high-carbon switch points, frogs and crossings; maintenance welding wobblers, spindles; welding of high-carbon heat-treatable castings, etc. Charts show hardness versus impact ratings.

210 GRINDING WHEELS — Chicago Wheel & Mfg. Co., Chicago 7. 62-page catalog tells about weld grinding as well as other grinding tasks. Clear illustrations show mounted wheels, cutters and grinding tools of all types.

211 STEEL HARDENING — Welding Equipment & Supply Co., Detroit 7. Bulletin describes "Hard-N-Tuff" steel hardening compound that is applied on small parts with an acetylene torch as heating source. It is said to increase tool life 300% in some cases.

212 BRONZE ROD—Eutectic Welding Alloys Corp., Flushing, N.Y. Bulletin TIS 997-P gives complete specifications and technical data on "EutecRod 148 C" a new bronze welding rod with a special flux coating. It tells how the rod bonds to dirty cast iron and also demonstrates other advantages.

213 AIRCRAFT WELDING—The Taylor-Winfield Corp., Warren, O. Reprint titled "Convair's New Rectifier Welders" tells how a west coast factory utilizes 10 new three-phase resistance welders to spot and seam weld assemblies for modern aircraft. Article originally appeared in THE WELDING ENGINEER, April, 1952.

214 RUST PROOFING PAINT—Unit Laboratories, Inc., Cleveland 12. Literature tells about a paint, "Rust Inhibitor No. FD-425" that dries on metal in 10 minutes and withstands temperatures from minus 100 to plus 250 F.

215 STUD WELDING—KSM Products, Inc., Merchantville 8, N.J. Folder describes uses of KSM arc welding studs in power plants, shipbuilding, draft fans, boilers, blowers and farm machinery.

216 CYLINDER POWER—Hanna Engineering Works, Chicago 22. Technical bulletin "Cylinder Power in Action" illustrates 16 cylinder-powered movements and shows 21 actual application photos. It states over 1000 ways that hydraulic or pneumatic cylinders can push, pull, lift, press, clamp and control.

217 WELDING CATALOG—Southern Oxygen Co., Washington 19, D.C. 64-page catalog of welding and cutting equipment, safety equipment and electric hand tools has been issued for welding users in the middle Atlantic states. It is specially compiled for easy selection of parts or tools.

218 WELDING GLOVES — Elliott Glove Co., Oconto, Wis. 4-page bulletin and insert describes welding gloves for arc and gas welding operators. Characteristics discussed are gunn and clute style thumbs, heavy cord sewing seams and various styles of welding, fleece lining and reinforcements.

219 TORCH-GUIDING MACHINE—Heath Engineering Co., Fort Collins, Colo. 4-page, two color bulletin tells all about the "Ultra-Graph" oxyacetylene torch guiding machine. Tracing head, operating adjustments and controls, capacities and specifications are pictured and/or tabulated.

220 ELECTRICAL CONNECTIONS—The Pyle-National Co., Chicago 5 New bulletin furnishes details on "Quel-Arc" circuit breaking plugs and receptacles for electrical circuits. Safety and construction features are explained and shown.

221 VISE PLIERS—H. R. Basford Co., San Francisco 3. Single-sheet bulletin describes "Gripco" lock-on pliers for welders, mechanics and assembly workers. Features are planar-grip jaws, safety trigger release and single-hand operation.

222 METAL CLEANING — Oakite Products, Inc., New York City 6. 6-page pocket-size brochure provides a concise account of a triple-duty prepaint cleaner, Oakite Compound No. 31. Applications and how-to-use instructions are given.

223 CABLE CONNECTORS—F. M. Anthony Co., Piedmont 11, Calif. 8-page bulletin tells about Anthony "Insul-Lock" electrical connectors and installation tools. How the connection is made, the special crimping tool used, various types of lugs and connectors are all covered.

224 DRUM SANDER—The Carborundum Co., Niagara Falls, N.Y. 4-page bulletin tells about the "Cone-Loc" drum sander for use with flexible shaft tools, shop grinders and polishers. Advantages of using short strips of coated abrasives to be rapidly fitted to the drum are explained.

225 8½% NICKEL STEEL—The International Nickel Co., Inc. 12-page paper gives a good review of the properties of low carbon 8½% nickel steel. Low temperature (—320F) properties are described as well as welding and forming characteristics. 20 tables and charts depict heat treating and welding properties.

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THE WELDING ENGINEER, AUG., 1952

Remember the trade marks "tt" and "TUBE-TURN" are applicable only to products of TUBE TURNS, INC.

Streamline your purchase of welding fittings

Scrappy says, "Aid defense—more scrap today... more steel tomorrow."

Write Dept. N-8 for free booklet listing properties of pipe and welding fitting and flange materials.

JUST AS THE USE of welding fittings streamlines a piping system so does the standardizing on TUBE-TURN Welding Fittings streamline your purchasing operations.

The TUBE-TURN Welding Reducer, both in the concentric type shown here and the eccentric type, is available in a complete range of sizes, wall thicknesses and types of materials. This is another example of how the complete TUBE TURNS' line is designed to meet all your requirements. It covers over 4000 different items. Thus you can simplify ordering and deliveries for any piping job by obtaining all your welding fittings and flanges from one reliable source . . . your TUBE TURNS' Distributor. You'll find one in every principal city.

Be sure you see the double "tt"

TUBE TURNS, INC. LOUISVILLE 1, KENTUCKY

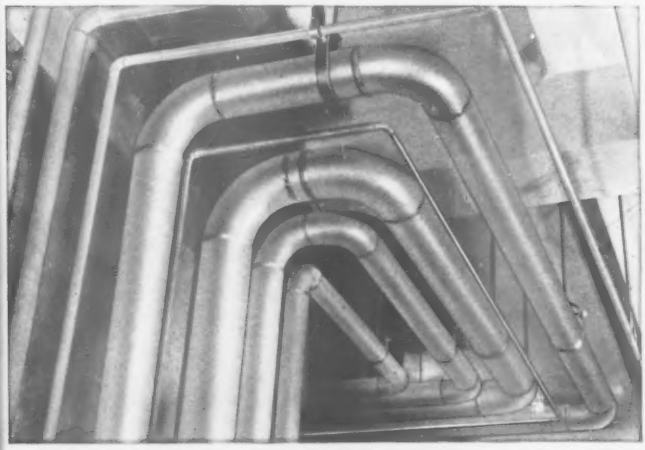
DISTRICT OFFICES: New York · Philadelphia · Pittsburgh · Chicago · Houston · Tulsa · San Francisco · Los Angeles
TUBE TURNS OF CANADA LIMITED, CHATHAM, ONTARIO... A wholly owned subsidiary of TUBE TURNS, INC.

30 Stories of New Building Ideas ...includes maintenance-free welded piping

ALUMINUM COMPANY OF AMERICA's new 30-story office building in Pittsburgh is a pacesetter for construction ideas. Exterior walls are made of sheet aluminum. Windows pivot on vertical axes to simplify cleaning. Radiant heating and cooling panels in ceilings increase rentable floor space.

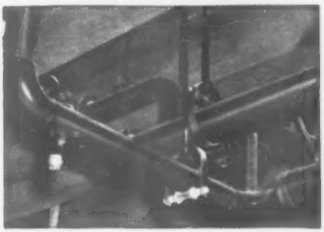
In keeping with this progressive design, a welded piping system, using TUBE-TURN Welding Fittings and Flanges, was specified. Thus piping, both aluminum and steel, will be leak-proof and maintenance-free. The variety of welding-fitting requirements posed no problem, since TUBE TURNS, INC. offers the world's broadest line of welding fittings and flanges—available in a wide range of types, sizes, and more than 40 different metals and alloys.

Alcoa's new office building. Architects: Harrison & Abramovitz. Assoc. Architects: Mitchell & Ritchey and Altenhof & Bown. Heating, Ventilating & Air Conditioning Sub-Contractors: Dravo Corp.; Plumbing Contractors: Sauer, Inc.



Corrosion-resistant aluminum lines for drinking, and hot and cold water supply saved critical copper. Note how welded lines, from 1" up, are fitted closely together, make for a neat installation. These lines will be insulated.

TUBE-TURN Welding Elbows, Tees, and Reducers used in steel piping for steam and hot water lines in basement. True circularity and uniform wall thickness of TUBE-TURN Welding Fittings expedited installation by insuring accurate fit.



Eight-inch steam line with 2" and 3" branches in fan room on roof. Use of welded system, with TUBE-TURN Welding Fittings, simplified piping design, gives streamlined appearance, eliminates maintenance problems.

TUBE TURNS, INC., Dept. N-8
224 East Broadway, Louisville 1, Kentucky

Your Name .....

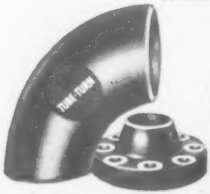
Position .....

Company .....

Nature of Business .....

Address .....

City ..... *State* .....



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Chicago	Los Angeles

"tt" and "TUBE-TURN" Reg. U.S. Pat. Off.

TUBE TURNS, INC.

LOUISVILLE 1, KENTUCKY

3M TEST REPORT:
STAINLESS STEEL WELDS

NAME OF COMPANY Shampaine Co.

BUSINESS Hospital Equipment Mfrs.

MATERIAL TESTED

	3M	COMPETITIVE
TYPE	Type C Discs	[redacted]
GRIT	#80	#80
SIZE	7" x $\frac{7}{8}$"	7" x $\frac{7}{8}$"

TEST RESULTS: 3M Discs remained serviceable after smoothing 30 welds (3 pieces). [redacted] disc was worn out after 10 welds (one piece). Operator, foreman and purchasing agent amazed at results. Order placed for 3M "C" Type Discs.

3M discs give triple wear!

Yes! This actual test report shows how the Shampaine Company cut abrasive costs with longer-lasting 3M Discs . . . finishing *three times* as many pieces with a 3M Type C Disc.

And 3M Methods Engineers can help you too. They are trained to analyze your abrasive requirements and recommend the right methods, the right materials that will speed production, cut costs on your grinding or finishing operations.

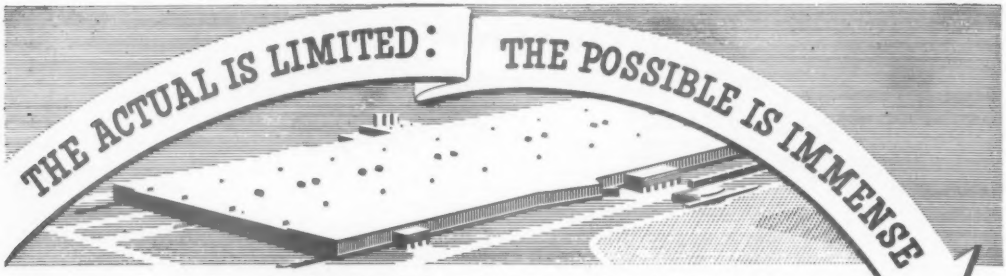
STAINLESS STEEL WELDS smoothed down in record time at Shampaine's St. Louis plant.

MINNESOTA MINING & MFG. CO.
Dept. WE-82, St. Paul 6, Minn.
☐ Please send me additional information on 3M Discs.
☐ Have a 3M Methods engineer call.

Name .....
Company .....
Address .....
City ..... Zone ..... State .....

Made in U. S. A. by **MINNESOTA MINING & MFG. CO.**
General Offices: Saint Paul 6, Minn.
In Canada: London, Ont., Can., Export: 122 E. 42nd St., New York City.

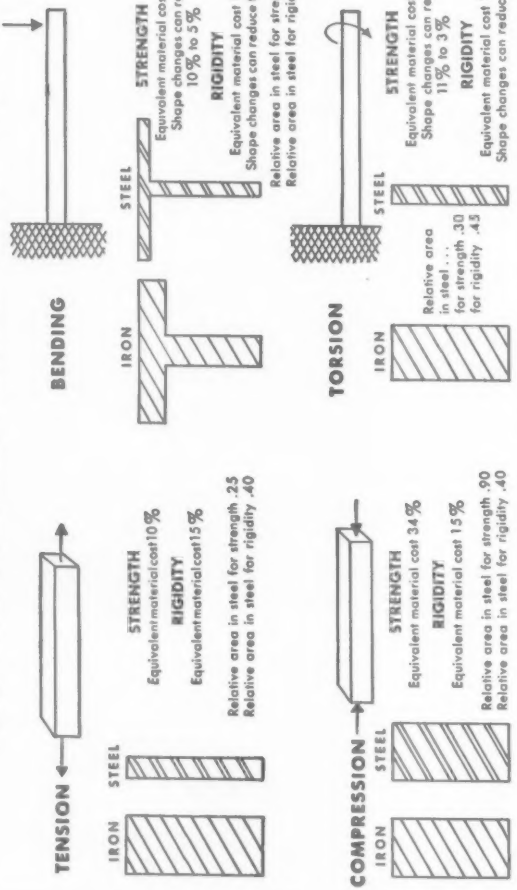
Makers of: "SCOTCH"® Pressure-Sensitive Tapes • "SCOTCH"® Sound Recording Tape • "3M"® Adhesives "UNDERSEAL"® Rubberized Coating • "SCOTCHLITE"® Reflective Sheeting • "SAFETY-WALK"® Non-Slip Surfacing



NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT

© LE Co. 1952,

ANALYSIS GUIDE TO EQUIVALENT SECTIONS IN STEEL FOR CONVERTING PRODUCT DESIGNS

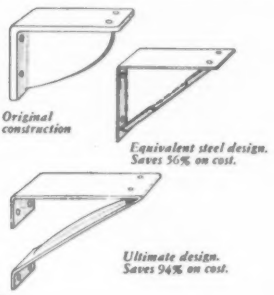


Relative cost of materials for equivalent sections in steel as compared to run-of-foundry gray iron. Sketches show relative areas of steel and iron for equal strength. Figures give comparative cost data for material required to duplicate strength as well as duplicate rigidity or stiffness. Figures are based on 6¢ per pound for steel and 1½¢ per pound for cast iron.

PROPER DESIGN IN WELDED STEEL IMPROVES PRODUCT AND LOWERS COST

The chart, at left, shows what relative areas in steel will carry similar loads in machine components built of run-of-foundry gray iron. Whenever product designs follow these values, material costs can be cut to 15% simply by substituting the correct amount of steel and without changing shape. Ultimately where the product is correctly shaped to use steel most efficiently, material costs may be reduced to 5% of the casting cost.

The designs below illustrate potential savings on simple machine parts with steel design. Material for the original design weighs 39 pounds, costs $9.10. However, by using the correct amount of steel, the weight is cut to 12 pounds and cost to $3.97. Changing the shape from a solid section to a formed channel cuts the ultimate weight to 9 pounds and material cost to $.58.



Original construction

Equivalent steel design. Saves 56% on cost.

Ultimate design. Saves 94% on cost.

HERE'S HOW

Machine Design Sheets are available on request. Designers and Engineers write on your letterhead to Dept. 78.

THE LINCOLN ELECTRIC COMPANY

CLEVELAND 17, OHIO

The World's Largest Manufacturer of Arc Welding Equipment

ESTABLISHED 1916 THE WELDING ENGINEER AUGUST, 1952

It's Your Money!

TO PARAPHRASE a well known quotation, a skunk by any other name is just as stinking. Taxes are pretty distasteful to everyone, but it was not until I had made a recent trip to Washington that I learned they are also becoming smelly to the present administration. The new name by which refined circles are hoping to disguise the odor is called "purchasing the goods and services of government."

Undisturbed, the skunk goes right on stinking. Last year the federal government collected 29% more from purchasers of "the goods and services of government" than it did in 1950. In 1951, the government's total take was $62,000,000,000, an astronomical figure that represents an average payment of $400 by each of the 155,000,000 men, women and children in the United States. That tidy little sum of $62,000,000,000 equals the entire income of all the 50,000,000 people who dwell in the 22 states west of the Mississippi River.

Our population has risen 20% during the 12 years since 1940. The tax load has come up 3,200%. That's for federal taxes. The one bright spot on a cloudy horizon is that state and local taxes have not increased in the same proportion as federal taxes. If they had, we would now be spending 100% of our income—instead of the present 35%—in purchasing the goods and services of government.

One out of every six dollars that is paid out for wages and salaries goes to a government worker, federal, state or local. They take home 17% of all wages and salaries paid during the year—a $32,000,000,000 payroll. This payroll has increased over 50% in less than two years—private payrolls have only gone up 26% during the same period.

THE number of stars in the Milky Way—estimated at a thousand billion—may soon be no more than the number of dollars that our federal government owes. On June 30, at the end of another fiscal year, the government was $259,150,744,000.47 in the red—exactly $1,671.94 for every man, woman and child. Last year those who are running affairs in Washington managed to spend over $4,000,000,000 more than they took in—even though it was the most prosperous year our government has ever known. Can you imagine a private business running in the red for 18 out of 20 years? If it survived, there would undoubtedly be a change in management. Maybe that's what we need in the biggest business of all.

The high-sounding title, "purchasing the goods and services of government," does not make things any easier for the taxpayer's pocketbook.

WERE there any real desire to do it, the federal tax load could be lessened. So much money is authorized for spending that a considerable amount of it is left unspent at the close of the fiscal year. At the close of the last fiscal year, for instance, there was a total of $91,100,000,000, of unspent balances from previous years. Yet the President requested $85,400,000,000 in additional funds for those agencies that didn't make quota.

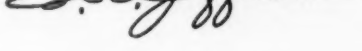
It seems to the writer that the amount of next year's budget appropriation is based on last year's balance. If there is a balance, let the next year's appropriation match it. That simple rule has been followed for two years now on the requests for money to be spent in the foreign aid program.

Let's look at the record. The various agencies dealing with foreign aid had a total of $7,328,000,000 in unspent funds from earlier appropriations on June 30, 1951. Yet in October, Congress appropriated an additional $7,329,000,000, practically doubling the balance. That wasn't enough for the greedy-guts so Congress was asked to appropriate $7,900,000,000 more. Congress, realizing that approximately $7,900,000,000 would be left over, reduced the amount of the appropriation a little, but even so there is close to $15,000,000,000 to be spent in the foreign aid funds.

Part of this foreign aid goes to France, which has a record of collecting only 17% of its taxes, and to Italy, where only 4% of the taxes are collected. Apparently, Americans are the only suckers.

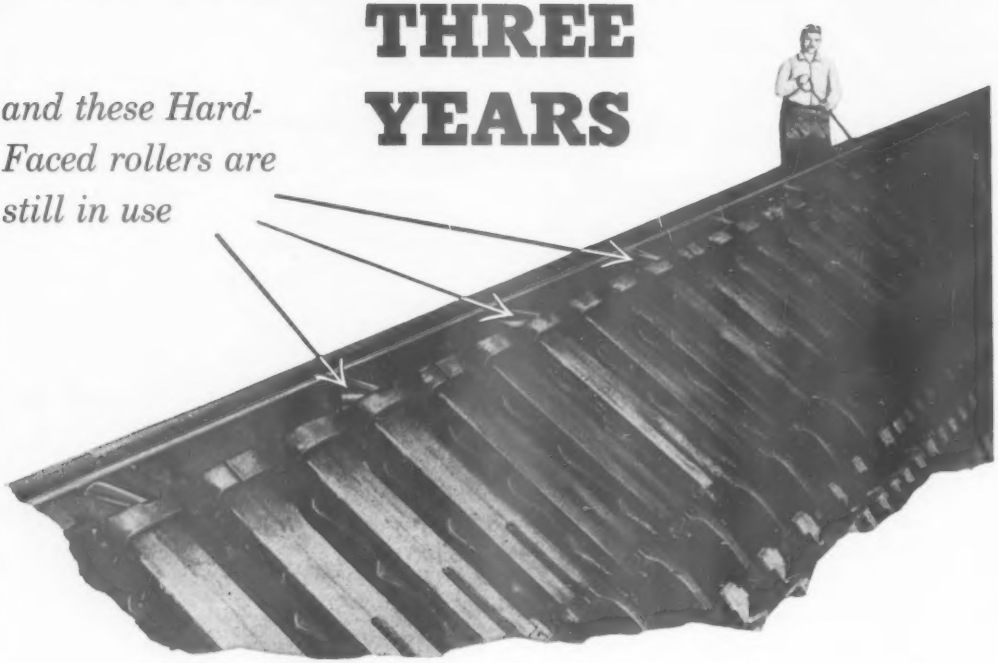
Our President, a spendthrift of the first water with other people's money, would like to have authority to spend nearly $175,000,000,000 in the next fiscal year. Compare that amount with the $62,000,000,000 collected in taxes during 1951!

It's your money they're spending! What are you going to do about it next November?



Carrying hot steel for THREE YEARS

and these Hard-Faced rollers are still in use



Three years ago, some cast iron cone rollers for this cooling bed were hard-faced with HAYNES alloy No. 92. Today, they are still carrying hot steel bars despite the continual impact, abrasion, and heat to which they have been subjected. Cast steel rollers on the same line, which were hard-faced with HAYNES STELLITE alloy No. 6, have also shown exceptional service — although they have not yet been in use as long as the cast iron ones.

HAYNES alloy No. 92, an iron-base alloy recommended for the cast iron parts, is exceptionally easy to apply by oxy-acetylene welding. It has a very low melting point and the molten alloy is quite fluid. Deposits have a Rockwell C hardness of 62-67 and excellent wear resistance.

HAYNES STELLITE alloy No. 6, the cobalt-base alloy used for hard-facing the cast steel parts, can be applied by metallic arc welding. Deposits are machinable and have excellent resistance to abrasion and heat.

For information on how to hard-face cast iron and cast steel parts, and on the alloys recommended for each job, write for a copy of "HAYNES Hard-Facing Manual."

HAYNES TRADE-MARK *alloys*

"Haynes" and "Haynes Stellite" are trade-marks of Union Carbide and Carbon Corporation.

Haynes Stellite Company
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1—SMALL parts, such as a nipple for an aircraft exhaust system, are adaptable to inert-arc metal-arc

2—LARGE work may be handled by same process. This weld joined dissimilar low-alloy and stainless steel

Steel Welded by Inert-Arc Metal-Arc

SOLAR Aircraft Co., San Diego, Calif., has developed new techniques and applications for the inert-arc metal-arc process. While other firms have used this process with aluminum and high-alloy materials, Solar is the first company, on the west coast, at least, to use the process other than experimentally on mild and low-alloy steels.

Ordinary inert-arc welding makes use of a fixed tungsten electrode. In the inert-arc metal-arc process, a consumable electrode in the form of a wire of the required diameter is fed automatically to the gas-shielded arc. The welding wire, of course, can be made to whatever chemical analysis may be required.

DEOXIDIZERS END POROSITY

Solar utilizes this advantage in the welding of mild steels. Previously, inert-arc welding had been found unsatisfactory on mild steels since gross porosity would result from gases in the steel. Now the chemistry of the welding wire has been so determined that deoxidizers are introduced into the weld. The deoxidizers react with the gases liberated from the molten steel, converting them into harmless compounds and thus preventing porosity. Chromium, manganese and silicon are embodied in the welding wire to serve as deoxidizers.

Solar has also applied inert-arc metal-arc welding to join dissimilar metals successfully. An example is the welding of low-alloy steel pipes to bellows made of stainless steel, to be discussed later on.

Another Solar discovery is that thinner materials can be welded with this process than had previously been thought possible. Stainless down to 0.050-in. thickness has been welded in production, even thinner gages experimentally.

Solar's welding technical group has designed and made its jigs and fixtures to use for development work in inert-arc metal-arc welding. The research group has ascertained speeds, current settings, sizes and compositions of welding wire and has, in effect, made the process applicable to the joining of ferrous materials on a production basis.

IT'S LIKE SUBMERGED-ARC

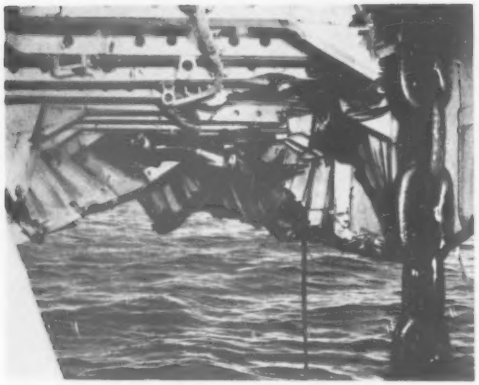
Two inert-arc welding heads, costing approximately $6,000 each, have been employed in production since the fall of 1951. These units can also be adapted to submerged-arc welding by changing the wire feed rolls and adding a flux feed. As may be seen from the pictures, they look more like submerged-arc welders than the inert-arc metal-arc manual welding gun.

3—WELDING a bellows-type expansion joint on 18-in. diameter pipe

One of the new welders is used to fillet weld a nipple to the B29 exhaust system. This part is quite small, about 2¾ in. in diameter. It is made of type 321 stainless steel and welded with type 347 wire. The production rate is 180 pieces an hour.

In Fig. 1, we see an operator looking through a No. 12 welding lens (large panel) to see how the weld is getting along. At the top of the welding lens is the handy control setting. Electronic control of the arc voltage

(Continued on page 64)



1—SIXTY feet of the lower bow of the *Wasp* looked like this after collision with the destroyer *Hobson*

2—CUTTING away damaged pipe to free anchor chain. Note the crushed pipe coming up through hole in deck

Wasp Gets a Hornet

On April 26, the USS *Wasp* had her bow stove in by collision. On May 18, the *Wasp* was again ready for active duty. Between these dates was a job for welding.

CAPTAIN A. L. Dunning, the author of this article, stands 6 ft. 6 in. tall and is reputed to be the tallest man in the Navy.

Born and raised in Japan, Dunning attended the Canadian Academy in Kobe, afterwards Worcester Academy in Massachusetts. He graduated a star man from Annapolis and was commissioned an ensign in 1927. After two years' service aboard the cruiser *Marblehead*, he was selected for postgraduate school training at Annapolis and M.I.T. in 1929. He received the degree of Master of Naval Architecture from M.I.T. in 1932.

During World War II, he served as new construction shipbuilding superintendent, Philadelphia Navy Yard, from 1941-1945. At the end of the war in 1945, he was assigned to the Naval Technical Mission to Japan and continued on the staff of the Commander Naval Forces, Japan, and Naval Forces Far East in Tokyo through 1947. His particular assignment was the organization of the salvage of sunken ships in and around Japan and the liquidation of the assets of the former Japanese Navy. This involved the scrapping of major ships and submarines. After his return to the United States, he was ordered to duty as production officer of the New York Naval Shipyard in 1950.

BY CAPT. A. L. DUNNING, USN

ON APRIL 26, 1952, the aircraft carrier USS *Wasp* collided in mid-ocean with one of her escorting destroyer-minesweepers, the USS *Hobson*. The *Wasp* was part of a task force due to replace other ships on station in the Mediterranean. It was of utmost importance to the Navy and Department of Defense that she be reconditioned as fast as possible and put back on the line.

From radio reports, it was possible to work out a sketch to tell the extent of the major damage to the *Wasp*. This seemed to be confined to the first 60 feet. Around the area of damage, at distances ranging from 6 to 40 feet, the ship retained undamaged and shored-up watertight bulkheads. She could stay afloat—and make port on her own power.

Shock Mounting Stood Test

Damage was slight to such units as the drainage pump in the forward pump room, anchor gear, forward gun battery and catapult tracks. A ship built to Navy specifications for the shock mounting of operating gear and mechanical units is able to withstand collisions or near misses from explosions without extensive mechanical or electrical failures.

Taking all these factors into consideration, it was decided that the *Wasp* should bring herself into New York harbor for repair and reconditioning.

Hornet Could Provide Bow

The New York Naval Shipyard was in a uniquely favorable position to handle the repair of the *Wasp*. It so happened that at this shipyard the *Hornet*, a sister ship of the same class as the *Wasp*, was at that very moment undergoing conversion. The *Hornet* was partially dismantled—the forward portion of the flight deck had been removed and part of her upper bow. The lower bow, however, was completely intact. Naval constructors decided to flame-cut off as much of the Hornet's lower bow as would be needed and install it on the *Wasp* as a complete assembly. A daring plan and an enormous job for welding!

First reports from the *Wasp* indicated most of the damage was below

3—CARRIER'S seagoing tractors teamed up to sweep below the keel for wreckage while the ship was at sea

4—TOTAL extent of the damage can now be seen. The picture was taken on May 8, shortly after dry docking

Bow

the fourth deck level. Although the local damage was severe, it seemed likely that there might be little or no distortion in the structure in back of the damaged section. To save time and make a better job, it was decided to take the Hornet's bow section from the keel to the fourth deck level and from the stem back to frame 15. When the *Wasp* arrived in the shipyard, it might be possible to salvage something of her lower bow for incorporation in an assembly that would later be installed to replace the missing section of the *Hornet*.

Work to prepare the bow of the *Hornet* started in the shipyard on April 28—just two days after the collision and while the *Wasp* was still nearly a thousand miles at sea. At this time also, assembly and shop work was started on the steel plates to bridge the severed *Hornet* bow and the still watertight sections on the homeward-bound *Wasp*. To facilitate this task, the shipyard received daily radio reports from the *Wasp* on her structural situation as she was being carefully piloted toward New York.

Upper Bow Protruded

Let's now have a look at the *Wasp*. The undamaged section above the chewed-off lower bow consisted of the flight deck with the plane catapults, the forecastle deck, main deck and second deck. The third deck was partially damaged. The upper section protruded like an enormous cantilever beam over 75 ft long. It would be able to hold itself up, however, if it were not subjected to too much strain from the sea or to a further extension of damage.

What the damaged part of the ship was like can be seen from Fig. 1, a view looking forward from bulkhead number 15. Luckily, the heavy chain pipes leading to the anchor chain locker and the mass of chains themselves had blunted the cutting edge of the entrained wreckage so that it did not tear further aft into the ship as it crept into port.

The *Wasp's* commanding officer was able to steer the ship and to control her movement so as to prevent any further damage to her forward structure. A secondary but important consideration was what might happen when the ship left deep water. Conceivably, downward-hanging wreckage might be able to ground the carrier in her entry to Ambrose Channel coming into New York Harbor. Besides structural wreckage from the *Wasp*, there was the possibility to be taken into account that a loop of the ship's anchor chain might also be carrying wreckage from the *Hobson*.

It seemed well to make a sea inspection. A destroyer left Newport, R. I., on Saturday May 3 with a party from the shipyard and rendezvoused with the *Wasp* on Sunday morning at a point about 250 miles off the coast. When the shipyard party arrived aboard, they learned that there was indeed wreckage extending below the bottom of the ship.

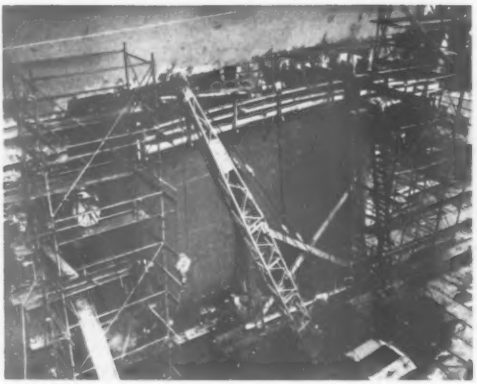
Battering by heavy waves on the entangled wreckage had caused it to shift and release both anchor chains. These in turn had apparently carried away the structure of the ship below the original gash from the stem back about 60 ft.

Anchor Chains in a Mess

The entire starboard anchor chain was hanging out. It led up through the damaged chain pipe around the anchor winch and to the anchor in its normal housed position in the hawse pipe. The port anchor chain had fallen out in a loop; one end of the chain went up through the chain pipe around the winch and to the anchor, while the far end was still secured to the damaged bulkhead of the chain locker.

The ship's crew had been successful in retrieving the port anchor chain up through the chain pipe and laying it out on the forecastle deck. As it was now secured, the damaged port chain pipe had dropped down to the far end of the port chain and stopped against the damaged bulkhead of the chain locker. The starboard chain, hanging down from the ship, had cut through the chain pipe in a slit between the second and third decks and was locked there in the slit of the pipe. Hanging below the ship and awash in the sea was the crushed lower portion of the starboard chain pipe that had originally been between the third and fourth decks. What was on the end of the

5—HORNET'S bow section, an 80-ton assembly, is on its way to the *Wasp* dry dock. Date of picture: May 9



6—NEW BOW was in place on May 11. Picture shows amount of fitting and assembly work that must be done

starboard anchor chain down to about 165 fathoms (990 ft) was anyone's guess, but it might include wreckage from the *Wasp* as well as tangled wreckage from the *Hobson*. With the ship steaming ahead at 10 knots, this anchor chain dragged aft at about a 45 deg downward angle.

The first order of business was to clear the starboard anchor chain. Next was to determine whether or not there was any other wreckage hanging down below the damaged area that might obstruct the ship's safe entry into Ambrose Channel. With the ship hove to in a moderate sea on Sunday May 4, there were essentially dry working conditions on the damaged third deck around the slit starboard anchor chain pipe. The slit in the pipe was cleared by oxyacetylene cutting torches, and a large opening was cut in the pipe.

Where the chain was resting against the lower slope of the pipe above the slit, the pipe was cut in strips. Pulling upon the chain would cause these strips to bell out and form a guiding entry for the chain back of the chain pipe. This idea proved to be successful on the first attempt. The anchor chain was pulled up on deck until the crushed portion of the lower chain pipe came up to the third deck level (Fig. 2). By the use of the oxyacetylene cutting torch, a large hole was cut in the third deck to admit this lower portion of the anchor chain pipe. It was simple to cut off sections of this pipe until the bind around the chain was cleared. The bottom portion of the now free chain pipe was securely shackled to ship's structure to prevent its loss and to provide a more normal lead of entry for the remainder of the chain.

The entire starboard chain was then pulled up on deck. On the end of it was found essentially all of bulkhead No. 8 for the two deck heights of the chain locker from the second platform to the fourth deck. The anchor chain end-fitting secured to this bulkhead and to the heavy vertical bulkhead stiffeners by welding had apparently held while the remainder of the ship's structure and wreckage from the *Hobson* had torn away from the bulkhead.

Sweeping for Wreckage

The second phase of checking the bottom was accomplished by devising a metal sweep to be pulled fore and aft while suspended horizontally athwartships below the base line of the ship. Using the flight deck of the aircraft carrier as a roadway, the carrier's small plane-handling tractors were teamed up to carry an extension boom out from each side of the ship (Fig. 3). From these booms, the sweep could be suspended at any desired depth. The sweep was made of available angle iron and plate in a 40-ft-long triangular prism 18 in. on each side. The width of the flight deck and the extension of the booms from the tractors permitted the 40-ft-sweep to be run from bow to aft of the damaged area without the supporting lines fouling the turn of the ship's bottom. The use of two tractors on the side, as shown in Fig. 3, was necessary since one tractor alone might be overbalanced by the extending boom; the inboard tractor formed a safety counterweight.

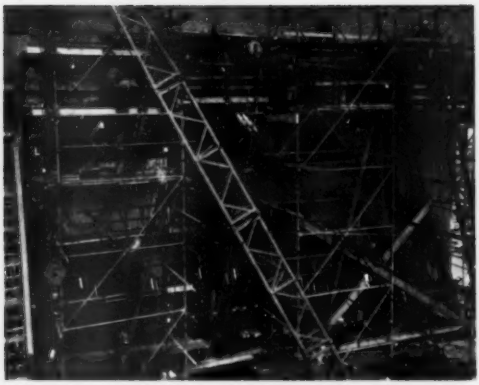
The depth setting was obtained by lowering the sweep into the sea from the overhang of the flight deck forward of the stem, setting it awash in the sea and then lowering it by the amount of the draft of the ship plus 10 ft.

One sweep was made running aft from the bow. The sweep boom was then raised 5 ft and a second sweep was made to assure that no wreckage protruded more than 5 ft. This was accomplished by noon of Monday May 5 and guaranteed safe entry into Ambrose Channel. The ship was then less than a day's run from New York at her reduced speed of 10 knots.

Inspection in Dry Dock

The ship was moored by the stern in Gravesend Bay of New York's outer harbor, and its ammunition and aviation gasoline were unloaded prior to the repair job. While unloading was going on, a diver carefully checked the bottom to assure that the ship could go directly to the waiting dock at Bayonne, N. J. The diver's inspection showed that the break of the keel at frame 13½ was practically a clean break—nothing projected that had to be cut off underwater before

7—SHELL plate is nearly ready for welding. Note local fairing insert in inner course of shell plate



8—CLOSING IN the starboard shell. Picture was taken on May 13 — only seven days after making port

the ship could go into dry dock.

On the same day that the diver made his check, a final decision was reached that the cut from the *Hornet* bow should be along a horizontal line one foot above the fourth deck level, including the bell mouths of the chain pipe to the chain locker. The vertical cut was to be at frame 12¼, thus leaving from six to eight feet all around for fairing to the structure of the *Wasp*.

The *Wasp* was landed in dry dock, and the dock was pumped down by noon of Thursday May 8. How the damage looked is pictured by Fig. 4. As the trimming back of the structure to sound material was in progress, the store rooms and pump rooms that were flooded just aft of the damaged areas were cleared of their oil-soaked stores. (The oil had been picked up from the ruptured fuel tanks of the *Hobson*.)

Fitting the Hornet Bow

It was clearly indicated that the work of repair was essentially a straightforward structural job and was not going to involve the re-alignment or remachining of mechanical units. The preparation of new structural materials for the contiguous areas to the bow assembly had been complete and included all the needed floors, frames, bulkheads, stringers, breast hooks, sections of platform decks, shell plates, doublers and even hatches and fittings.

The bow of the *Hornet* as prepared on first notice of the collision could be used directly. This 80-ton section from the stem back to frame 12¼ was cut clear and skidded out from the *Hornet* on the same day that the *Wasp* was placed in dock. The *Hornet's* lower bow was then loaded on a barge and hauled by tugs to the *Wasp's* dry dock (Fig. 5). Within the first 24 hours after the docking, the *Hornet* bow was being aligned in the dock with the *Wasp* (see front cover illustration). The wreckage was sufficiently cleared so that by 34 hours from the time the dock was dry, the new bow assembly was in final position (Fig. 6), ready for the structural assembly work between it and the sound structure of the *Wasp*.

There remained many fitting problems to be worked out in fairing into the damaged structure. The extent of the cutback line on the *Wasp* from frame 15 forward was along the third deck line. On the starboard side, this left a fair surface to land on with a closing strake of plating butted to the grafted bow assembly and outside lapped to the *Wasp* structure. On the port side, there were local distortions that made it impossible to obtain a fair enough surface to lap to. This was taken care of by the insertion of local insert plates (Fig. 7). The flexibility that welding permits made it possible to obtain a sound job and a well appearing finished shell in short order.

Above the third deck area, on the sweep of the bow plating around the hawse pipe area, local punctures and distortions were corrected by occasional flush-welded inserts. Fairing doublers of 10-lb (¼ in.) plating were applied from the outside over sound but unfair areas. Figure 9, a view of the bow section port side, shows fairing doubler plates faintly outlined above the water line. The doublers were fillet welded around their boundaries; plug welds were used to quilt the larger panel areas, and finally the space between doublers and basic structure was gunned with standard gunning compound.

Progress Was Rapid

By the third day in dry dock, the structural trades were in full swing applying the know-how of fitters, weldors and flame-cutting operators to each local problem as it came up. Progress was so rapid that a daily report could be only a running check. By the end of the fourth day in dock, there was sufficient make-up to the grafted bow to form a definite support to the cantilevered structure above the damage. This gave sufficient structural support to allow the cutting through of the transverse dips in the main and second decks on the starboard side at frame 15. With welded construction, this presented no problem. Locally applied strongbacks were used to straighten the areas, and the shrinkage upon rewelding the cuts completely faired the decks. There remained no further concern for the ship's fundamental structural strength forward.

9—PORT side of bow. Fairing doubler plates faintly outlined above waterline

10—TEN DAYS in dry dock, and the big repair job was completed. Here we see the *Wasp* on May 18—on her way out and as good as new

The inner and outer stem plates required furnace work of 30-lb (¾ in.) plating. These plates were already on their mock-ups in the shop waiting for the word of any minor changes in form that might be required because of the local conditions. There was some heavy structural work involved in repair to the damaged port chain pipe and almost a complete renewal of the starboard chain pipe.

Working in Cramped Quarters

As work progressed around the clock and the area in which men could effectively work became relatively small (Fig. 8), the spirit of getting the job done in quick time became infectious. The rivalry built up between shifts became intense as each man attempted to do his best and yet not interfere with the man working next to him. Cutters and weldors worked out ingenious solutions of hanging asbestos curtains or using sheet-metal guards between each other for protection. In spite of these precautions, one weldor claimed an arc was struck on the metal toe-guard of his safety shoe by the man working below him. Another weldor allowed as how he had indulged in six-day bicycle races but none like this one.

Among supervision, such ideas developed as the obtaining of a roll in a shell doubler in the dock instead of taking the time to have the plate rolled in the shop. This was done by packing the plate on stage planking and running the rubber-tired crane over the plate to give it the approximate rolled shape. The plate could then be further drawn to the shell by routine methods of welded clips and wedges.

A target date was set up to be able to flood the dock by the tenth day and still allow one-day margin for going out of dock on the eleventh day. This was accomplished on schedule. By the tenth day (Fig. 10), the structural job was done, fitted, welded and air tested for tightness, compartment by compartment. The chain locker had been refitted with its wooden protective battens, painted and both chains re-installed. The interior fitting out of stowages, wiring, sounding tubes, etc., though still to be completed, was done in the one-day margin while the ship was retained in dock and in the final day-and-a-half while the ship was reloading her ammunitions at anchor at Gravesend Bay.

As the final check on the catapult alignment, a series of deadload shots were fired. These demonstrated conclusively that the ship's structure was sound and undistorted.

Two Tons of Electrodes

To accomplish this big task, 4,300 lb of grade E-6010 electrodes were needed. The structural material was all mild steel, the plating used varying from ¼-in. plate for the fairing doublers up to as high as ¾-in. plate for the flat keel, garboard strakes, bulkhead No. 4 and the stem plates. The bulk of the shell was 5/16-in. plate. With this weight of plating, the water-tight boundaries were made up in multiple-pass beads, all deposited by manual arc welding. Welds were generally fillet attachments of framing bulkheads and deck and groove welds where flush seams were used in plating. All groove welds were of the B-17 and B-14 types; that is, single-vee butt joints welded both sides. The welding work peaked at 100 men spaced over the three shifts.

For the cutting operations, 72,500 cu ft of oxygen and 28,800 cu ft of acetylene were used. The oxygen was provided from trailers, while the acetylene was supplied from manifolded cylinders, both located alongside the dock. The oxyacetylene cutting was done principally by hand torches. For the preparation of new plating, portable straightline cutting machines were used. The number of men used for oxyacetylene cutting peaked at 53 divided between the three shifts.

The New York Naval Shipyard is justly proud of the commendatory comments received as typified by the dispatch from the Commander Naval Air Forces Atlantic:

"The expeditious manner in which the New York Naval Shipyard completed the work on the *Wasp* is an inspiring example to the fleet and the Naval Establishment. The motto of the 'Can Do' shipyard is well earned and deservedly famous."

All photos official photos U. S. Navy

Specialist in Hard Jobs

This is the story of a relatively small plant with big-league equipment. It is able to tackle the hard, specialized welding jobs in a scientific manner.

BY FRED M. BURT

LET US dwell for a moment on a gruesome idea. Let us suppose that Joe Stalin and his cohorts in the Kremlin were to be granted just one wish, without any reservations, by some supernatural power. To put the United States in an impotent, helpless condition, all they need wish for would be that every weldment we have made and are making should suddenly become unbuttoned.

Without welding, most of our progress of the past half century or more would be well nigh sunk. Over the past five years, I have sent in about three dozen articles to my good friend, Ted Jefferson, the editor of this magazine. Yet I am constantly conscious of the fact that I am not much more than scratching the surface of welding knowledge. Too many experts are making too many developments too fast for one man to keep up.

This prologue is by way of leading up to the story of a specialist—a very modern, though relatively small, welding plant. The company is the Automatic Welding Company, Inc., of Los Angeles.

Men and Equipment

This new and very young company is a prime example of one of the finer aspects of private enterprise. The key men are: Richard M. Blair, who has had twenty years of diversified welding experience with several local companies; Neil J. Sinclair, a graduate of Harvard University Business School with a wide range of sales promotion and welding experience in California and, until recently, Byron R. Russell, with Linde Air Products for ten years as a welding engineer specializing in submerged-arc and inert-arc welding.

"Autoweld's" physical premises consists of 3,200 sq ft of working space plus a large adjoining storage yard. Its basic equipment includes:

Two circumferential rotating submerged-arc welders that can handle diameters of from 1 to 60 in.

Four longitudinal welders that can handle lengths from 2 in. to 15 ft.

One semiautomatic submerged-arc welder for use on curved seams.

Five 500-amp a-c welders.

One 300-amp a-c welder.

One 300-amp d-c welder.

One 175-amp d-c welder.

Five inert-arc welding heads.

Two oxyacetylene welding units and three oxyacetylene cutting units.

Three oxyhydrogen units for aluminum welding.

Layout tables, 15-in. lathe, grinders and air compressor.

Hard Job No. 1

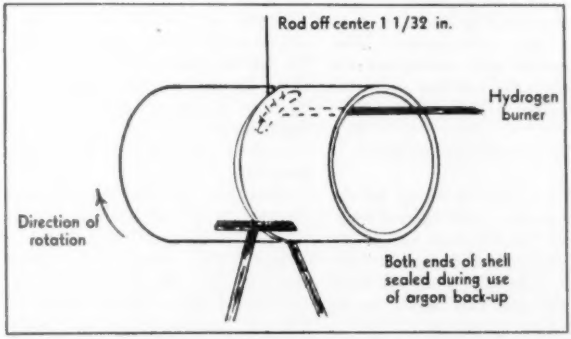
A good example of the company's approach to the analysis of a difficult welding job is embodied in a report on the investigation of welding methods for SAE 4140 steel. We quote:

"Based on the operational procedure established by customer's aircraft division, experimental welding was conducted employing the submerged-arc process and a submerged-arc and inert-arc combination of welding. Before welding the three samples, certain essential preparations were made, listed as follows:

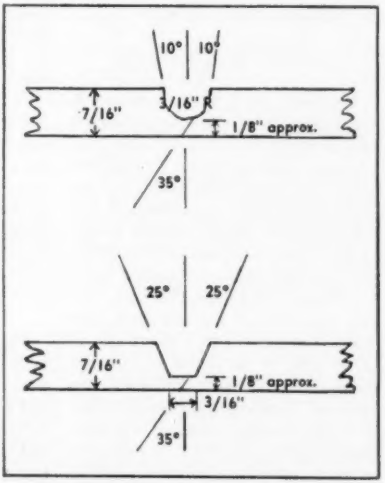
"1. Machining arbor and fixture to hold and align welded parts on rotating positioner, eliminating necessity of tacking.

"2. Fabricating a hydrogen burner, which was installed internally in or-

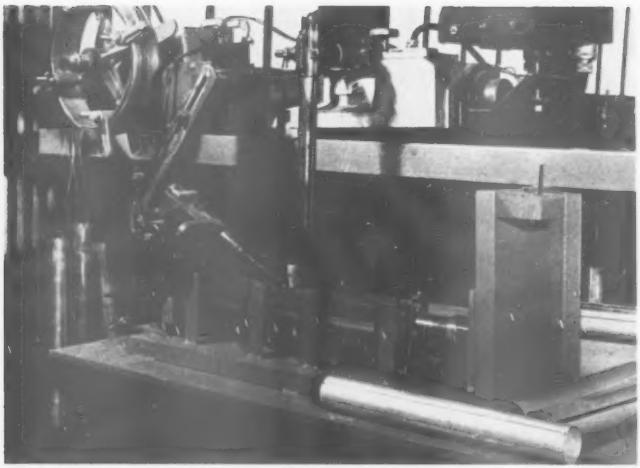
Hard Job No. 1: To make a detailed investigation of welding methods for chrome-moly steel pipe



1—SET-UP for the preheat and stress-relieving heating heads used in recommended test procedure for 4140 chrome-moly steel



2—JOINT designs recommended for the pipes include U- and modified V-grooves



3—PRECISION fixture that holds the raw edges of strips of aluminum (rolled for tubing) in exact abutting alignment for inert-arc seam welding

der to keep oxidation to a minimum.

"3. Procuring and assembling adjustable multiflame oxyacetylene heating heads for preheat and postheat purposes.

"4. Installing other necessary brackets to control radiation heating during the prolonged stress-relieving period.

"5. Installing calibrated direct-reading instruments for measuring amperage, voltage and rod lengths.

"6. Procuring and machining 12-in.-diameter standard-wall steel pipe for the purpose of establishing basic welding conditions which appear on the following illustrations."

Welding Wire 0.47% C

Materials: A 5/32-in. submerged-arc welding wire was selected with a carbon range of 0.47-0.53% C. This wire was selected because its carbon range was considered suitable for the high heat-treat physicals demanded of the weldment. Other elements in the analysis are: manganese 0.70-0.95%; silicon 0.20-0.35%; chromium 0.80-1.10% and vanadium 0.15-0.18%. The flux was one of the standard submerged-arc fluxes with a screen size of 12 by 150. So as not to use up the scarce 4140, ordinary mild-steel pipe with wall thickness comparable to the 4140 chrome-moly material was substituted in this test. The mild-steel pipe served to determine the most suitable conditions that could be used in production welding of the 4140 material. States the company's report:

"Considerable knowledge and basic welding conditions have been established in spite of the relatively few samples available for a test of this type. The optimum of joint design and welding conditions are those which provide:

"1. Economy of preparation.

"2. Maximum alignment.

"3. Accuracy and consistency of preparation, which will balance out the inconsistencies inherent with automatic welding.

"4. Homogeneous deposit of weld metal without inherent stress raisers or cracks and with a deposit such that the joint can be filled with the least number of passes.

"Considering the knowledge gained and results obtained, we would recommend that serious thought be given to the test designated as No. 3. It is our conclusion that a combination inert-arc bottom pass and a succeeding submerged-arc weld will best meet the requirements."

Recommended Procedure

Figure 1 shows the set-up for the preheat and stress-relief heating heads used in test No. 3. Preheat was at 400-600 F and stress relief at 1,100-1,200 F, both for a time of 30 minutes. Both ends of the shell were sealed for an argon back-up.

The weld was made in three passes. First and second passes were manual inert-arc welds and the third pass was a submerged-arc weld. For the first pass, the current setting was 220 amp, d-c straight polarity, and the welding speed was 15 ipm. Argon flow to the arc was 40 cu ft per hour, and for the back-up approximately 20 cu ft per hour of argon were needed.

Current setting for the second pass was 240 amp, d-c straight polarity. Speed was again 15 ipm, and the same quantities of argon were used for the arc and for the back-up.

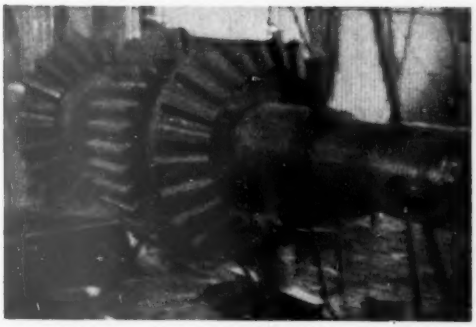
The third pass was made by an a-c submerged-arc head, using 600 amp and 28 volts. Speed was 12½ ipm. A hydrogen back-up was employed for this pass instead of the argon atmosphere used in the two preceding passes.

The joint designs recommended as the results of the three tests are shown in Fig. 2.

Following this preliminary investigation with mild-steel pipes, nine tensile test specimens of 4140 steel were welded as per the recommendations. These were tested in an outside testing laboratory. Average ultimate load for the nine specimens was around 170,400 psi, with a range of from 142,100 to 195,000 psi. Elongation ranged from 1% in two inches (six specimens) to 2%. Average hardness was 39.8 Rockwell C for the thick section and 39.1 Rockwell C for the thin section of pipe.

"Seamless" Welds in Tubing

Another special job just started in production at this writing is for the Atomic Energy Commission via an aircraft plant. Required are several thousand 2⅜-in. OD tubes of 61-SO aluminum alloy in lengths between 18⅛ in. and 24 in., with walls 0.025 in. thick. After the aluminum strips are rolled into tubular form, they are placed in a precision fixture that holds the raw edges in exact abutting alignment for inert-arc seam welding (see Fig. 3). Before welding starts, the slight burrs on the raw edges are removed by using a narrow rounded steel wheel mounted on a handle. A 1/16-in. wire of a 5% silicon aluminum alloy is used. Because of the thinness of the aluminum tubing, this is a very ticklish welding job. Success requires: (1) adequate backing; (2) the edges held in exact position and (3) the maintenance of the proper heat and proper travel speed without variation for each seam. Any cause of



4—BEARING surfaces of a shaft for a rolling mill were built up to dimensions by automatic hard-facing

5–SPIRAL application of hard-facing material on oil-well scraper shaft. Checked to 1/32-in. tolerance

travel hesitation had to be eliminated, or holes would have been burned in the metal.

Each welded seam was given a dye-penetrant test for detection of minute surface imperfections. These show up as red lines on a white background.

One of the most important requirements was that the tubing and the weld should be virtually the same, as the end use requires the properties of extruded tubing. Hence the welding had to be done to maintain virtually the same thickness at the weld as at other circumferential points. The reason for welding the tubing was that the extruded tubing desired was unavailable.

Hard-Facing and Rebuilding

Besides a wide variety of aircraft tubing, other major shop production involves automatic hard-facing and rebuilding. Parts (many of them expensive or hard to replace) especially subject to wear or abrasion are renovated for a new period of service, which is sometimes longer than the service life of a new part.

Let us look at some examples of this sort of work. The 15-ft-long shaft for a rolling mill shown in Fig. 4 was built up to original dimensions at four 10-in.-wide bearing surfaces. This shaft is of 1020 cold-rolled steel. The build-up was accomplished by means of an automatic hard-facing process.

On an oil-well scraper shaft, hard-facing material was laid down spirally (Fig. 5) by correlating the rotation speed of the shaft with the travel of the submerged-arc head. Depth of the hard-faced deposits was checked to within 1/32-in. tolerance by slipping "go" and "no go" rings over the shaft. By controlling the application of the hard-facing, grinding time was cut down from hours to minutes.

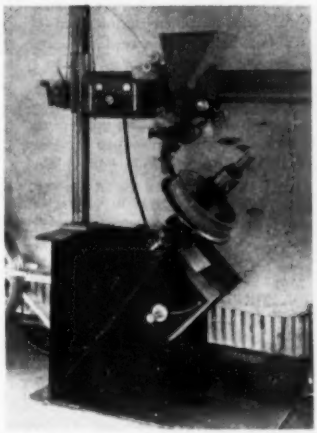
Hard-facing is applied in much the same manner to mine car wheels and other types of wheels up to 60-in. diameter in order to build up the tread and flange surfaces. The job of applying hard-facing to a wheel is done in a precision manner. Normally, less than 1/16 in. of the added layer has to be machined off.

Figure 6 shows a mine car wheel being rotated in the automatic hard-facing machine. The wheel is mounted between cones. The lower cone is stationary and bolted to the shaft, while the upper cone is held by a quick-change nut with longitudinal and transverse keyways providing for fast adjustment. The all-welded box at the base contains the driving mechanism, which employs hydraulic transmission and has a variable speed control. Adjustment can be made to any angle desired through the use of a spring-loaded pin and holes bored in the box.

Welds Tractor Rails

"Autoweld" is one of the first shops to weld tractor rails automatically. For this purpose a 16-ft welding fixture is used. The hard-facing rod is 5/32 in., of the type of material found to be most durable.

Heretofore it has been necessary to disassemble the track, placing the units end to end in the fixture, build them up to original dimensions and then grind and reassemble. Autoweld has perfected a method and constructed special equipment so that the rails can be rebuilt by the submerged-arc process while fully assembled. The equipment is easily portable, and the hard-facing can be applied in the field. All that the tractor owner is required to do is to "unbutton" the track by removing the master pin and bushing.



6—MINE car wheel in automatic hard-facing machine. Wheel position is adjustable to any angle

Sprockets are re-ringed or re-hubbed by hard-facing. Grousers are rebuilt to full height; rollers and idlers have their surfaces and flanges rebuilt.

Building up Die Blocks

Highly specialized work is the building up of die blocks. A recent example is a 2,300-lb Heppenstall die block that was built up by the inert-arc process, using thoriated tungsten electrodes with straight-polarity d-c. Atomic-hydrogen welding is also done on such jobs. Each bead is given a dye-penetrant test as it is laid.

Keeping Big Equipment in Service—II

Welding for Maintenance

WHEREVER men work with machines and metal, welding is being used for the maintenance of equipment. In more remote areas, particularly, welding is indispensable to maintenance men who are forced to repair broken or worn parts (with the materials on hand) when replacements are not available.

It is the purpose of this series of articles to show some of the ways in which welding is helping to keep big equipment in service. In the June, 1952, issue, Mr. Jefferson discussed dredge pump maintenance, a field in which he is a recognized expert. The present article deals with the maintenance of shovel teeth and tractor grouser plates. Some very specific cost comparison figures are offered.

BY T. B. JEFFERSON

MAINTENANCE welding may be classified under two general headings: outdoor and indoor maintenance. Today we are going to talk about the maintenance of equipment that is used outside. Of course the work on the outside equipment is often done inside for convenience's sake. It still classifies as outdoor.

More than $50,000,000 was spent in 1951 for the maintenance welding of equipment normally used in outdoor jobs. This includes: (1) equipment of mines and oil fields; (2) earth-moving equipment used in construction activities of all kinds and (3) farm equipment. Because the out-of-doors is a dirty place, there is always the opportunity for abrasive wear on outside equipment. This may be no more severe than the abrasive action of dust in the atmosphere, but in other circumstances the abrading action might be greatly enhanced by normal operation of the particular equipment.

Abrasion and Impact Wear

Draglines, shovels, tractors, scrapers and graders are examples of equipment subjected to abrasive wear in normal course of their operation. Equipment of this type is designed to cut into earth and break it up so it may be moved to another location. That means constant abrasion.

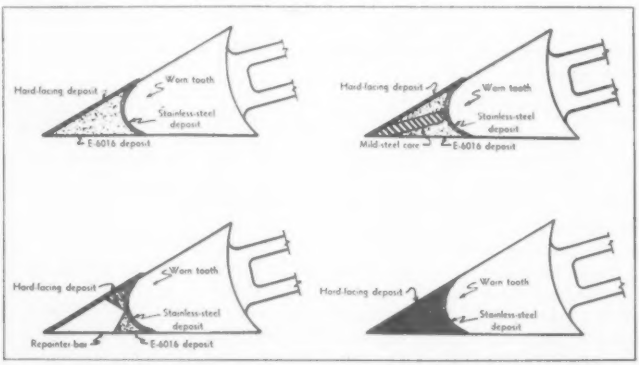
The most severe abrasive action of all is encountered by the teeth placed on dragline buckets and shovel dippers. These teeth not only scoop up sand, gravel, rock and other highly abrasive materials, but they are also subjected to severe impact wear by bumping against the above mentioned materials under working conditions.

Figure 1 shows a worn bucket tooth (left) with a companion tooth rebuilt by hard-facing. You would naturally expect that everyone would be willing to use welding and hard-facing to reclaim dipper and bucket teeth, but this is not the case. Worn teeth are often discarded because the men in charge of maintenance do not feel that hard-facing is a satisfactory way of maintaining dipper teeth. They do not feel that the use of hard-facing offers a maximum performance at minimum cost. Likewise, they are not certain that teeth reclaimed by hard-facing and welding are the most economical from the standpoints of initial cost and ultimate life.

Proving Ground for Repair

One contractor was definitely in doubt as to the answers to these questions but was willing to be convinced. He decided that the ideal proving ground would be a borrow pit excavation where three two-yard Diesel shovels were working. Since these shovels were the same make and similar in every respect, it was logical to assume that under comparable working conditions the dipper and dipper teeth would be subjected to similar wear characteristics.

1—WORN bucket tooth (at left) with tooth rebuilt by hard-facing



2—FOUR WAYS in which teeth may be rebuilt. Sketch at top right illustrates the method used for shovel No. 2, the test shovel described in text

Dipper Teeth

Table I. Shovel 3 Maintenance Cost

4 original tooth points	@ $23.00 each	$92.00
1 replacement point	@ $23.00 each	23.00
First resharpening—4 points 2½ hrs labor and forge	@ $4.00/hr	10.00
Second resharpening—4 points 1¾ hrs labor and forge	@ $4.00/hr	7.00
Third resharpening—4 points 2½ hrs labor and forge	@ $4.00/hr	10.00
Total cost		$142.00

Table II. Shovel 1 Maintenance Cost

4 original tooth points	@ $23.00 each	$ 92.00
1.9 replacement sets	@ $92.00/set	$174.80
		$266.80

Table III. Dipper Point Welded Repair Costs

Labor 1½hrs	@ $3.00/hr	$ 4.50
2.7 lb of E-6016 electrodes	@ $0.15/lb	.41
0.2 lb of stainless	@ $0.96/lb	.19
0.4 lb of hard-facing	@ $2.25/lb	.90
1.5 lb of mild-steel plate	@ $0.15/lb	.23
		$ 6.23
Cost/set of 4 tooth points		$24.92

Table IV. Shovel 2 Dipper Maintenance Cost

4 original tooth points	@ $23.00 each	$ 92.00
1.94 sets reclaimed points	@ $24.92/set	48.34
.5 sets reclaimed points	@ $24.92/set	12.46
Total maintenance cost		$152.80

Table V. Comparative Cost of Dipper Teeth

Shovel 1 (new points)	$266.80
Shovel 2 (welding repairs)	$152.80
Shovel 3 (forging)	$142.00

To begin the test, the three shovel dippers were fitted with new teeth having detachable points. As the tooth points became worn to the extent that they noticeably reduced production, they were replaced by the following methods:

Shovel No. 1 received a new set of points.

Shovel No. 2 had its original points welded and hard-faced.

Shovel No. 3 was refitted with its original teeth resharpened by forging.

These three comparative methods of replacing teeth were believed to be the most common means of maintaining sharp teeth on power shovel dippers.

Welding and Hard-facing

The several ways of reclaiming teeth by welding and hard-facing are indicated by the four sketches of Fig. 2. The sketch at top right shows the manner in which the teeth on shovel No. 2 were rebuilt. Inasmuch as the procedure for rebuilding a tooth is well known, there is no reason for giving details regarding the welding technique. A brief description will suffice.

First, the worn end of the manganese-steel tooth point was tinned with stainless steel; this insured a good bond for the E-6016 electrode that was to provide the filler metal. To reduce the amount of filler metal required, a mild-steel core made from ½-in. steel plate was welded in place. Finally, the upper face of the tooth and the sides of all the replaced metal were protected by an extremely hard overlay of hard-facing material. This application made the tooth self-sharpening.

The Forging Method

When the test got underway, the first problem developed among the teeth resharpened by forging—one of the tooth points was broken. For teeth repaired by welding, the fabrication of the missing portion would not have presented too great a problem. Welding was not to be used, however, on this test set. To forge a new point on the broken tooth would make it much shorter than its companions and so it would shirk its share of the digging. This left two alternatives; either replace the broken tooth with a new point or cut the three remaining teeth down to the size of the reforged broken tooth.

It was more economical, of course, to install a new tooth point. To do this, however, it was necessary to cut away much of the wearing life of the new tooth by bringing it down to the size of the other teeth. This had to be done, though, so all would work together effectively.

It was possible to reforge these teeth three times before they became so short that replacement was necessary. The cost of tooth maintenance during the life of these points on shovel No. 3 is shown in Table I.

The life of the points on shovel No. 3 became the standard by which the other points in the test were gaged. During this same period, shovel No. 1 (new points) used 2.9 sets of teeth. The 0.9 of a set was computed by noting the yardage on the tooth points of shovel No. 1 at the time the points on shovel No. 3 were removed. After noting this yardage, shovel No. 1 continued to dig until the points were worn to an extent to warrant replacement, when the yardage was again noted. By these two yardage figures, it was possible to compute the percentage of life that had been used up when the points on shovel No. 3 failed.

The cost of tooth maintenance on shovel No. 1, which used new points throughout the test, is given in Table II.

Welding Method

Let us now look at shovel No. 2, which had its points welded and hard-faced. By computation on a yardage basis similar to that explained above, it was determined that the hard-facing points of shovel No. 2 had worn to such an extent that 2.94 sets of teeth were used on shovel 2 during the life of the teeth on shovel No. 3. In addition two teeth were broken: one new tooth and one tooth that had been rebuilt. Total cost of reclaiming these teeth by welding and hard-facing is given in Table IV, while the costs of dipper point repairs by welding are detailed in Table III. Comparison of

3—RECLAMATION of worn track rollers for tractors can be done to good advantage by automatic hard-facing

4—OLD rollers shown at the left come out looking like this when the hard-facing build-up is completed

the costs for the three basic methods of maintaining shovel tooth points is presented in Table V.

The results of this test seemed to indicate that forging was the most economical way of maintaining these shovel teeth (Table V). The contractor felt, however, that this would not be the case when all the facts were considered. Before either shovel No. 1 or No. 3 could be ready for further service, it would be necessary to install a set of new points on the dipper, an expenditure of $92. On shovel No. 2, a set of points could be reconditioned for a total cost of $24.92. Considering these facts, welding and hard-facing proved to be the most economical way to lower maintenance costs over a prolonged period of operation.

Figures on Grouser Plates

It is not often that contractors are so thorough on their cost-keeping records. Records similar to this study of dipper teeth were kept, however, for the maintenance of grouser plates on a crawler-type tractor.

Experience on every hand indicates that it is not only economical but also expedient to reclaim the rollers and rails of crawler-type tractors. Material shortages have made it extremely desirable to use automatic welding equipment for such jobs. Likewise, automatic hard-facing can be used advantageously to produce a reclaimed part that has a new look and better than new wear-resisting characteristics.

Complete details as to how automatic welding is being used to reclaim tractor parts were given in the article, "Keeping Tractors in Service," August, 1951, issue of The Welding Engineer. Figure 3 pictures a number of worn track rollers awaiting hard-facing at the Peoria Tractor & Equipment Co., Peoria, Ill. The finished results are shown in Fig. 4. Though hard-facing most certainly is highly satisfactory on tractor rollers and rails, the question to be answered was: Would it work on grouser plates?

On this particular job, the grouser plates were subjected to extremely severe wear. The average life of a heat-treated grouser plate was only 40 days of 24-hr day operation (only heat-treated plates were used because ordinary plates were too short lived). After 40 days of service, the cleats on a grouser would become so badly worn that it was impossible to obtain satisfactory traction. This condition could not be tolerated as maximum pulling ability was essential for a tractor engaged in pulling rippers, scrapers and other pieces of road-building equipment. Something had to be done.

New grouser plates are expensive. The cost of replacing a worn set with new plates was found to be $901.68, as detailed in Table VI. Delay time has to be included in this table since the tractor is out of service for five hours during the replacement. A delay cost of $10 per hour is allowed for this period, a reasonable rental figure for the use of tractors of this type.

Savings by Welding

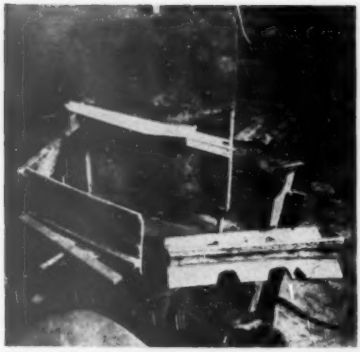
Instead of buying new plates for $901.68, it should be preferable to repair the old ones by welding at a total cost of $661.44. Table VII gives the detailed breakdown of costs. By studying this table, it may readily be seen that the saving is considerable, even with a delay time of 40 hours as against 5 hours when replacing with new plates. The welded repairs were made without removing the grouser plates from the tractor, saving $76 in bolts. At the same time, however, the delay cost was increased by $350.

Could Reduce Delay Time

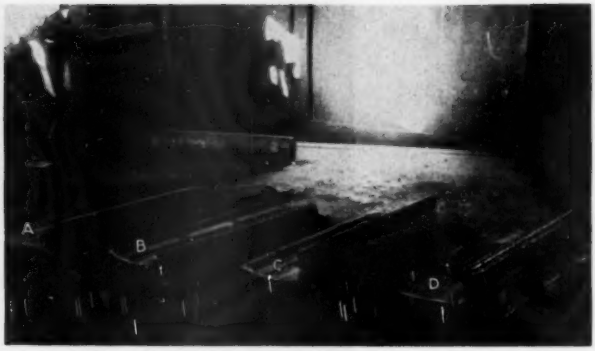
The 40 hours of delay were necessitated by the inability of a weldor to reclaim more than 16 plates in an 8-hr shift. The delay time could have been reduced by using more than one weldor to make the repairs or (as is possible where the tractor is in service only 8 or 16 hrs a day) making the repairs in periods when the tractor is not in service. Adopting one of these alternatives would naturally reduce the overall costs of the welding repair.

It should be noted in the interests of fairness that the whole saving in grouser plate bolts does not always occur. Usually there are some loose bolts that must be replaced, which narrows the margin between replacement of the plates and rebuilding of them by welding and hard-facing. In view of this, welding hardly seemed worthwhile, and it probably wasn't. Finally, though, an aggressive weldor conceived the idea of putting the rebuilding of grouser plates on an assembly-line basis.

This system can only be worked where an extra set of plates is available—true in this instance. The idea was to substitute the extra plates for the worn plates and reclaim the worn ones when they were off the tractor, thereby incurring no delay costs. This



5—WELDOR built a rotating table that holds grouser plates for reconditioning



6—WORN cleat of grouser plate (A) is trimmed (B) to a uniform height. Bar is welded on (C) and then protected by hard-facing (D)

immediately resulted in a $6.24 saving per plate. Since the reclaimed plates could be installed for the same cost as the new plates, the overall saving then became $474.24. It must be remembered, though, that this saving was possible only because a spare set of plates was on hand. In other words, it was brought about only because there had been an additional investment in grouser plates—the purchase of a spare set. This wasn't the saving our aggressive weldor had planned Where he wanted to save was in production.

Fixture for Positioning

He greatly increased the quantity of work produced by building a rotating positioning table (Fig. 5) to hold the plates during their reconditioning. Prior to use of this fixture, 16 plates were considered the maximum for an 8-hr day. With the fixture, a weldor and helper could step production up to 35 plates in the same period of time. This was possible because the weldor confined his activities to welding while his helper positioned the plates. When a plate had been welded in one position, the fixture was rotated to bring another plate into position.

In this operation, the worn grouser plate was taken through four steps (A, B, C and D of Fig. 6). In the worn grouser pictured in position A, the edges of the cleat have worn more than the center. The cleat is trimmed down to a uniform height across the entire face as the first step in reclamation (position B). Then the normal height is restored by welding on a ½ by ¾ in. bar of SAE 1040 steel (position C). After the bar has been tacked and welded in place, the cleat is protected with hard-facing, which gives the finished grouser plate shown in D.

By this speeded-up method of reclamation, it was possible to reclaim grouser plates for $1.87 each, as detailed in Table VIII. The overall cost of reconditioning a complete set of 76 grouser plates was reduced to $142.12. The total saving over new plates is $593.56.

Such a substantial saving leaves no doubt as to the advantage of reclaiming grouser plates by hard-facing. Any time an equipment user can reduce his normal operating costs by 50%, he has found a money maker. Hard-facing as a means of reclamation was even better than the figures indicate however, since it not only reduced the original cost by more than 50% but considerably lengthened the life of the hard-faced grouser plates.

Grouser Plates

Table VI. Grouser Plate Replacement

76 plates	@ $9.68	$735.68
304 bolts	@ $0.25	76.00
Labor 20 hrs	@ $2.00/hr	40.00
"Delay" time 5 hrs	@ $10.00/hr	50.00
		$901.68

Table VII. Welding Repair Cost, Grouser Plates

Labor ¾ hr	@ $3.00	$ 2.25
2.6 lb of 24" x ½" x ¾" SAE 1040 bar	@ $0.10/lb	.26
1.5 lb of E-6016 electrodes	@ $0.15/lb	.23
1.4 lb of hard-facing	@ 0.50/lb	.70
		$ 3.44
76 plates	@ $3.44	$261.44
"Delay" 40 hours	@ $10.00	400.00
Total cost		$661.44

Table VIII. Production Welding, Grouser Plates

Labor 35 plates/8 hr shift—	@ $3.00/hr	
Cost per plate		$ 0.68
2.6 lb of 24" x ½" x ¾" SAE 1040 bar	@ $0.10/lb	.26
1.5 lb of E-6016 electrodes	@ $0.15/lb	.23
1.4 lb of hard-facing	@ $0.50/lb	.70
		$ 1.87
76 plates	@ $1.87	$142.12

INSIDE of tank, weldor is welding a chain fitting to the floor. Note loops of the heating coil. Manhole opening is the same as one shown from outside in the opposite picture

Photos courtesy Air Reduction Sales Co.

Inside

MAKING vertical weld (inside) that joins two of the four plates that form tank's bottom course

LOOKING up at roof; note I-beam framing and manhole similar to the one pictured at bottom wall

Welding—Inside

Tanks for storage of fatty acids were fabricated by welding aluminum plate 3/8 in. thick from both sides. Two weldors built a 20-ft tank in 200 hours.

BY PAUL A. RODECKI
President, Universal Copper Works, Inc.

IT IS the business of A. Gross and Co., Newark, N. J., a firm established in 1837, to split and distill fatty acids, needed for a great variety of commercial uses. For nearly fifty years, the welding problems of this chemical company have been handled by the Universal Copper Works, Inc., also of Newark. When two companies have behind them the accumulated experience gained from coöperation for that length of time, their operating practices should deserve study.

Storage in Aluminum

Commercial fatty acids are distilled by Gross following the high-pressure splitting of animal and vegetable fats. Procedures must be strictly observed. Moreover, the best storage control practices for protecting and preserving the properties of these fatty acids are constantly pursued and applied.

All-welded aluminum tanks are now being used for the storage of fatty acids prior to shipment. All parts of the storage system in contact with the fatty acids are made of aluminum. Aluminum offers protective insurance against discoloration, loss of stability and other acid-corrupting influences that are traceable to corrosion in the older types of tankage, piping and apparatus.

20-Ft Diameter Tanks

As part of a replacement and expansion program at Gross and Co., Universal Copper Works, Inc. is now engaged in the fabrication of four 20-ft-diameter storage tanks of 2S aluminum plate, mainly 3/8 in. thick. Each of these large tanks is 21 ft high and has a storage capacity of approximately 50,000 gallons.

During the past six years, 15 smaller tanks varying in diameter from 6 to 13 feet and in height from 5 to 12 feet were fabricated from 3/16 and 1/4 in. aluminum. The majority of these small tanks were fabricated in

OUTSIDE of tank, weldor is making the fillet weld that joins the manhole to the bottom course. Fillet welds were also made to install fittings for heating coil (seen in foreground)

Outside and Out

the shop of Universal Copper by using the inert-gas tungsten-arc process.

Before starting the fabrication of the new large tanks to be erected in the field, an investigation was made of alternate welding processes. The inert-metal-arc welding method was selected as the process to use for a number of reasons, all of which added up to savings in time and money. The speed and weld quality of this process distinguish it as an excellent welding means for aluminum and other hard-to-weld metals ¼ in. and thicker.

High Current, High Speed

High current densities (due to a heavy current being carried on a relatively small wire) provide high deposition rates. This means high-speed welding, excellent penetration and a lesser time exposed to heat. The welding speed attained makes it possible to restrict the heat-affected zones and to minimize distortion and other undesirable heat effects. The arc is self-regulating; that is, the wire automatically burns back to maintain proper arc length. Since the operator does not have to adjust the electrode's distance from the work, he can devote all of his attention to manipulation of the weld puddle.

The elimination of fluxes and slag insures not only the highest quality of weld result but adds speed to an already inherently fast welding tool.

80% Helium Mixture

The shielding gas may be either helium or argon or a mixture of both. In this case, it was a mixture of 80% helium, 20% argon. The current used was 210 amp, reverse-polarity d-c. The electrical characteristics of direct current offer definite operating advantages, especially under open-field conditions. Stubborn oxide films characteristic of aluminum are broken up and "lifted" electrically with this type of current.

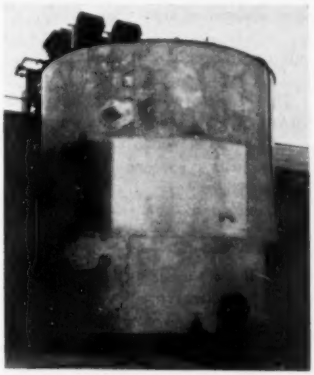
In the particular application at A. Gross & Co., each aluminum tank required about 1,000 ft of linear weld. The welding gun was used with 1/16-in. 2S electrode wire for the aluminum plate. To weld structural elements composed of 61S-T6 aluminum, a 1/16-in. 43S wire was used.

One Ounce Per Ft

Less than one ounce of filler metal was consumed per foot, and only 50 to 60 lb of filler wire were needed to

(Continued on page 66)

MAKING vertical weld (outside); compare this picture with photo on page 36 horizontally opposite



COMPLETED tank at temporary location. Use of lightweight aluminum simplies the job of moving

1—INNER combustion chambers for turbojets flow down production lines of the Ryan Aeronautical Co. in a seemingly unending stream

2—TWELVE spot welds are made at a time in these outer combustion chambers

Torture Chambers

Thousands of combustion chambers and transition liners for General Electric J-47 jet engines are fabricated on streamlined production lines. These components withstand extreme temperatures and high-velocity gas flow.

CONSISTING of inner and outer chambers, the combustion chamber assembly is the torrid heart of the turbojet. These chambers contain the raging flames that consume hundreds of gallons of fuel for every hour that the plane stays in the air. Unlike the cylinders in a piston-type engine, however, they are made from thin sheet instead of from cast metal.

WOULD HEAT 50-STORY BUILDING

The heat output from the furious furnace that is the turbojet engine is enough, if reduced to room temperature, to heat a 50-story office building with 4,000 rooms.

At top speed, the J-47 compresses several tons of air per minute, only a small portion of which is consumed in combustion. The tremendous heat of the blast expands the balance of the air and causes it to whip through the transition liners and fight its way between the turbine buckets. The caged gases hurl the buckets aside, spinning the turbine and compressor at tremendous speeds. Finally, the exhaust spurts from the tailpipe at a 20-mile-a-minute clip.

INNER COMBUSTION CHAMBERS

The function of the inner combustion chamber is to burn as much fuel and air as possible in the briefest time and space. To drive a jet compressor requires more than 100 hp for each pound of air delivered per second. One pound of air a second provides about 50 pounds of thrust. Since the J-47 produces about 5,200 pounds of thrust, its turbine must deliver in the neighborhood of 10,400 hp. This mighty force is unleashed within the inner combustion chambers.

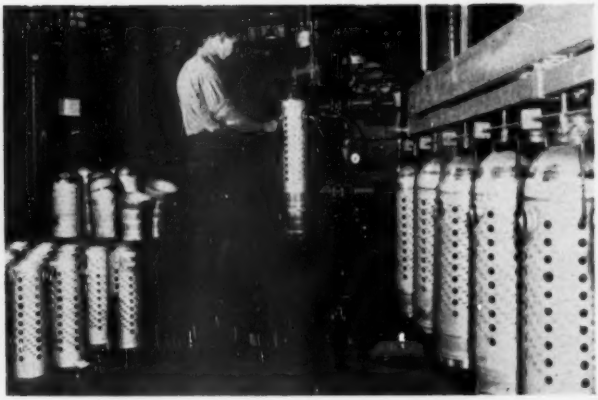
Ryan Aeronautical Co., San Diego, Calif., builds J-47 inner combustion chambers from Inconel, which is a tough, heat-resistant chrome-nickel alloy. The sheets are blanked and pierced in precision dies by huge presses. They are rolled into circular form and welded along their seams with automatic inert arc machines. Power punch presses, which may exert a force of as much as 105 tons at each impact, cut out the holes and louvers. The intricate pattern of holes and louvers, which permits just the right amount of air to enter and mix the burning fuel, may be seen in the inner combustion chambers pictured in Fig. 1.

The chamber, cap and exit shell are aligned and automatically spot tacked together in a specially designed welding machine (Fig. 4) that makes four spot welds at a time. Thirty-two welds are made in a matter of minutes to form this assembly. Then the seams are closed with fast seam-welding wheels; fittings are spot welded on, and the assembly is ready for a series of minute inspections. When it passes this scrutiny, it is boxed and shipped to the General Electric assembly plant, Lockland, O., to be incorporated in a J-47 jet engine.

OUTER COMBUSTION CHAMBERS

The inner combustion chambers are inserted into outer combustion chambers. These hermetically sealed tubes of stainless steel are built in similar fashion to the methods used for inner chambers. Figure 2 shows an ingenious new machine that makes 12 spot welds simultaneously on an outer combustion chamber. Figure 3 shows how the assembly is seam welded to form gastight seams.

3—FAST welding wheels give gastight seams to the outer combustion chambers



4—DESIGNED for inner combustion chamber fabrication, this new spot welder automatically aligns chamber shell, cap and exit shell

for Jet Engines

The function of the outer combustion chamber is to direct tremendous quantities of compressed air into the inner chamber, for both combustion and expansion. The air also acts as a cooling shroud for the inner chamber; this cooling effect is attained by a sheet of air flowing between the inner and outer chambers to carry heat away from the raging fires. The combustion unit is designed to start the burning of the fuel at the front end of the inner chamber and to complete the combustion before the gases reach the rear.

If the flame front follows the hot exhaust from the chamber (or bursts out through the holes and louvers), a "hot spot" will develop. This phenomenon results in the flames surrounding both surfaces of the inner combustion chamber. Since the cooling air is prevented from coming in contact with the metal, a sudden temperature rise occurs, which consumes the metal in this area. It is a testimonial to General Electric designers that huge quantities of fuel are successfully burned without metal attrition in the restricted space allocated in the inner combustion chambers.

Because the inner and outer combustion chambers must fit together in perfect alignment, close control of the dimensions of these components is a vital requirement of their fabrication. When the inner chamber is inserted into the outer shell, the maximum allowable clearance between the two at the flange ring is a minute fraction of an inch.

Because of extremely high operating temperatures of the inner combustion chambers, wide variations must be accommodated. Provision for thermal expansion of the inner chambers is made by suspending them from the fuel nozzle entry and allowing them to join the transition liners, at the rear, by means of a slip-fit connection. Outer combustion chambers are fitted with a stainless-steel bellows at the rear end, which provides them with a flexible joint for thermal expansion and to facilitate assembly.

Two of the inner chambers in each J-47 jet engine are equipped with spark plugs for initial ignition. Through a series of interconnecting "cross-over" tubes, the adjoining chambers are quickly ignited, much as the pilot light on a gas range ignites the burners.

Transition Liners

The dramatic functions of the combustion chamber have overshadowed the less known transition liners, to which little popular attention has been accorded. These irregularly shaped ducts receive the searing exhaust from the inner chambers and direct it to the nozzles and buckets of the turbine section. Their front cross-sectional opening is circular to mate with the inner combustion chambers, but at the rear the cross-section is almost rectangular to steer the fast flowing gases into a turbine wheel arc.

Ryan builds these transition components from Inconel. In many ways they are the most critical sheet-metal part of the turbojet—even more critical than the combustion chambers. For in addition to the withering temperatures of the blasting gases, the transition liner is submitted to pressure pulsations in the gas stream flowing through them. Not only is precision necessary but also the highest quality control. Even a scratch could develop into a stress fracture under the severe temperature and pulsating pressures peculiar to transition liner service.

For combat duty, the jet engine is proving itself to be remarkably reliable and rugged. A Korean report tells of one case where a .50-caliber bullet went through a combustion chamber without disturbing engine operation and was not discovered until inspection.

Control of the engineering requirements of G-E components at Ryan is under the supervision of L. A. Prchal, project engineer. Robert Chase, general foreman, directs the jet assembly lines where combustion chambers and other parts are fabricated.

BY F. R. DRAHOS

Metallurgist, Byron Jackson Co., Los Angeles

IT IS *the business of the Byron Jackson Co. to manufacture pumps of many types and sizes and to provide the oil fields with the specialized heavy tools that are required. "Welding," states the author of this article, "has become as indispensable to this industry as casting, machining and heat treating."*

In the July, 1952, issue of THE WELDING ENGINEER, *Mr. Drahos discussed the manufacture of pumps. In selecting the materials used for centrifugal pumps, the designer must consider not only strength requirements but also resistance to corrosion, abrasion, fatigue and impact over the range from sub-zero to elevated temperatures. Among the large variety of materials used for pump construction may be mentioned carbon and low-alloy steels, high-tensile steels, the stainless group, nickel-base "Hastelloys," Inconel, Monel and others.*

This month Mr. Drahos takes up the other aspect of Byron Jackson's two-sided business: the manufacture of oil-well tools. Most of these tools are castings of large size, and the materials are high-hardenability and heat-treatable steels. The welding problems are interesting, but the right answers seem to have been found.—THE EDITORS.

1—HOOK body component 14 in. thick gives an idea of the size of castings for oil-well tools

2—FRACTURED 300-ton hook body shows what can happen when wrong welding methods are used

Pumps and Oil-Field

If proper precautions are taken, dependable welds can be made in most high-tensile, high-hardenability steels and in the heat-and corrosion-resistant alloys.

OIL-WELL tools of today are required to meet service demands that were unheard of a few years ago. To keep pace with deeper drilling practices and to withstand the longer and more abusive field operations, the oil-tool industry has constantly sought for better manufacturing operations.

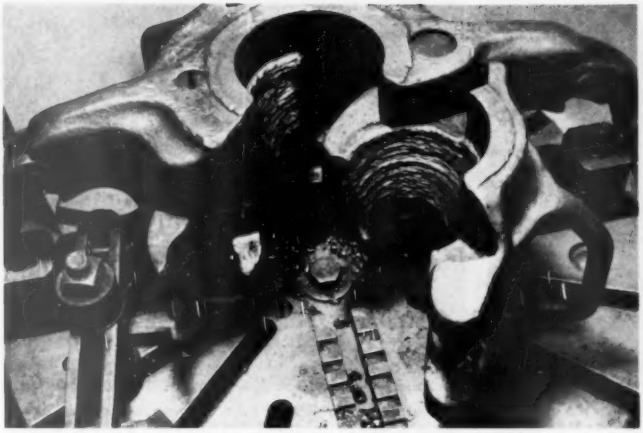
Fusion welding, as used in the production of oil-field tools, is divided into two categories: manufacturing and reclamation. The largest percentage of oil tools are of cast construction, and the materials are high-hardenability and heat-treatable steels in either an oil-quenched and tempered or a normalized and tempered condition.

Successful welding of alloy-steel castings is almost entirely a matter of shop control. Practically all such castings must receive both a preheating and stress-relief heat treatment. The more exact the shop heat treatments, the higher the percentages of carbon and various alloying elements that may be used in the casting without destroying its weldability.

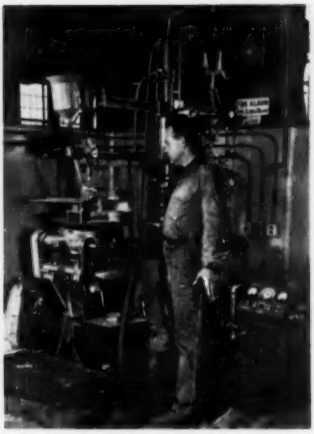
Our largest tonnage of materials is composed of a modified AISI 4130 steel or modified NE8630 steel, although other materials such as 4140 and 9440 are used. Practically all welds are manual, multiple-pass. Electrodes are selected to give physical properties equivalent to the material being welded after suitable heat treatment. Welding characteristics such as freedom from porosity, cracking, etc. are of equal importance. For the low-alloy, high-hardenability steels, we use a low-hydrogen, lime-ferritic E-12016 electrode that will closely match the hardness of the parent metal after heat treating. This electrode is used primarily for strength welds. Room-temperature physical tests of production-welded joint specimens indicate very satisfactory properties.

A 2,100-LB HOOK

An indication of casting size is a hook body component (Fig. 1) that has a maximum section of about 14 in. and weighs about 2,100 lb. The material is a modified NE8630 and is used in a normalized and tempered condition. This casting was designed to carry a rated load of 300 tons with a safety factor of 4 to 1. Any welding on a casting of this type must be properly made. The welding procedure consists of furnace heating the casting to the normalizing temperature, which is 1,700 F, holding the proper time to insure thorough heating and removing the casting from the furnace. The casting is allowed to cool to 600-700 F, at which temperature the necessary welding is performed; after welding



3—OVERLAY weld made on elevator castings requires some exacting properties. A low-hydrogen electrode with a high-carbon steel core wire gives welds that are free from porosity and machinable after stress relieving



4—SUBMERGED-ARC equipment reduced weld time on tong parts from 1 hr to 2 minutes per weld

Tools-II

has been completed, the casting is allowed to cool to atmospheric temperature. The casting is then returned to heat treat for tempering, after which it is hardness inspected, shotblasted and magnetically inspected. This procedure eliminates a special heating operation for welding and assures a weld that possesses equivalent properties to the parent metal. The welding rod is a low-hydrogen AWS Class E-12016 electrode.

Figure 2 shows the result of improper welding control. This progressive failure of a 300-ton hook body was the result of a weld made in the field, incorrect electrode and failure to stress relieve the material after welding.

Overlay Welding

Another type of weld made on elevator castings (Fig. 3) requires some exacting properties. This overlay weld is made with a 5/32-in. low-hydrogen electrode. The high-carbon, medium-manganese core wire combined with an all-mineral coating adequately satisfies four primary requirements: (1) freedom from porosity and cracking; (2) machinability after stress relieving; (3) good impact resistance and (4) flame-hardenability to 48-52 Rockwell C. The surface to be overlaid is undercut 3/16 in. preparatory to welding. The casting is preheated to 500-700 F before welding and stress relieved at 1,150 F or quenched and tempered to specification.

Welded alloy-steel castings of high hardenability may fail because the operator was not fully acquainted with the characteristics of the material. One service failure resulted from an unfavorable hardness gradient due to improper welding control. In this case, the abrupt change of hardness and physical properties in the welded area created a line of stress concentration that resulted in the failure.

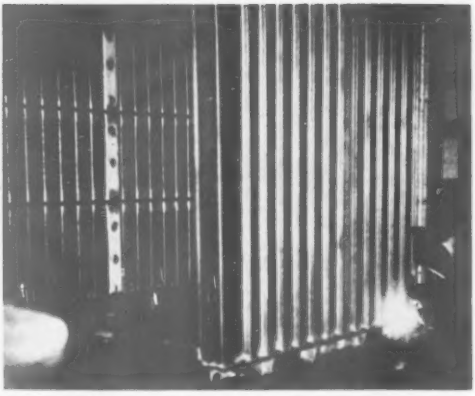
1 Hour Cut to 2 Minutes

A considerable saving in time and quality has resulted from the specially designed submerged-arc installation shown in Fig. 4. This is used for the plug welding of various tong parts. We have cut welding time from one hour to two minutes for each plug weld, and have secured sound, homogeneous welds that possesss equivalent physical properties to the material being welded.

To insure uniformity of products, all castings and forgings as received are sent through magnetic-particle or radiographic inspection as a routine check on quality. When defects are disclosed, their nature and extent must be determined. If the defect is repairable and will not affect the function of the part, it is chipped or ground out. After complete removal has been verified by magnetic inspection, the part is sent to the weld shop, where it is preheated to the proper temperature and welded. After welding, the part is stress relieved and normalized or quenched and tempered to hardness specifications. It is then sent back to magnetic-particle inspection and rechecked as a final operation. In this way, we maintain control over all welding operations and are certain of their quality.

It has not been possible in these articles to touch on more than a few of the applications of welding in the manufacture of centrifugal pumps and oil-field tools. We feel that welded fabrication can be utilized to advantage and that component parts of different types of materials can be joined by welding to plates, forgings and tubing to produce complex assemblies. Inspection methods available make it possible to be assured that the welds will be sound, free from defects and possess properties equivalent to those of the parent metal.

1—SPOT WELDING stiffeners into a "cargotainer" door. Note the rollers on the table that holds work



2—ARC WELDING is done as the cargotainer nears final assembly. Here side panels are joined to bottom

5—SEMIAUTOMATIC head is converted to automatic welding by mounting it on carriage of cutting machine

Diversified

This busy (and highly successful) Seattle job shop needs many welding processes. Flohr & Co. will contract for either a single weldment or a production item.

FLOHR & Co., metal fabricator of Seattle, Wash., probably has more diversification and more diversified welding than any other concern in the Pacific northwest. Diversified welding is essential to manufacturing, for there is great variation in this company's metal fabrication.

Flohr produces items for industrial plants belonging to building construction, marine, pulp and paper, chemical food production industries, and for gasoline and oil distribution plants. All of these items are tailor-made. Among the specially made items are huge bins and hoppers for sand and gravel operators, large pipes and ducts, tanks for boats and dummy stacks for ships, steel window sills for hotels and buildings and steel barges.

In addition to its job-shop work, the company does what at least borders on mass production. It is in continuous production of oil and gas storage tanks for above and underground use—capacities of from seven barrels to 10,000 gallons. Though these are the only catalog items, the firm receives many orders that would be rated as mass-production jobs. Water breakers of 24-gage galvanized steel for the fishing industry are an example; up to 500 of these are made a year, and repeat orders are received yearly. Some of the latest government orders (such as "cargotainers" for the Navy) approach the mass-produced orders with 80 or more units ordered at a time.

In spite of its occasional production orders, Flohr & Co. techniquely rates as a job shop. A diversity of jobs are done every day—a fish slimer being made here and chutes, bucket elevators or conveyors being made there. When there is a "set" production of one item, the flexible and set production take place simultaneously.

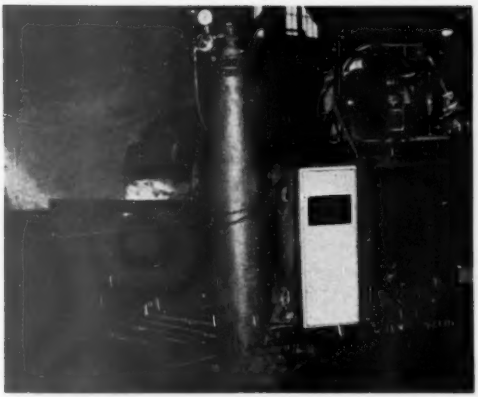
Welding shares the spotlight in such a set-up. The shop is studded with all sorts of welding equipment: spot welders, manual arc welders and inert-arc heads, both tungsten-arc and metal-arc. Much of the a-c and d-c equipment is raised off the floor on shelves (Fig. 7). There are four such set-ups throughout the plant and one outside in a special shed. Welders are out of the way, and floor space is conserved.

Nearly every known metal, in thickness from 26-gage sheet to ½-in. plate, is welded in this shop. Most frequently used materials are mild-steel plate and hot-rolled and galvanized steel sheet. Aluminum, Monel, copper and stainless steel are also welded.

Parts to be welded may weigh anywhere from ½-lb machinery guards to 175-ton steel barges. Handling of the parts requires a study in itself; methods will depend on size, whether a half dozen or a couple of hundred parts will be made, type of welding to be done, etc.

SPOT WELDING

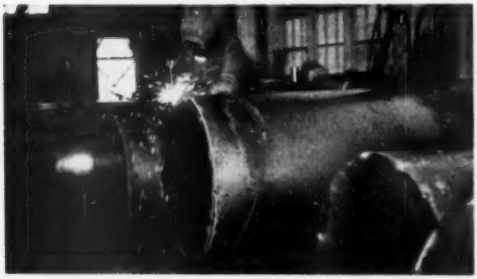
A 75-kva spot welder is used on as many jobs as possible. Products spot welded include water breakers and oil



3—INERT-ARC metal-arc welding on aluminum-bronze tank. The tank must be non-magnetic for a minesweeper

4—TUNGSTEN-ARC welding on fish freezing tray. A simple slotted jig holds parts while corners are done

Welding



6—MANUAL arc welding on seven-barrel tanks for underground oil storage. Note how tank rotates on jig

BY HOWARD JACKSON

tanks for the fishing industry, porthole wind scoops, crab cooker baskets, vent pipes, window sills and cargotainer doors.

A limited number of window sills were spot welded for the Hotel Washington. A simple stand was made to hold the sills at the proper height at one end while the operator welded at the other end. Cargotainer doors are spot welded in larger quantities, and a number of stiffeners are added to each door. Here the jig is more elaborate: it consists of an adjustable steel table equipped with a series of rollers (Fig. 1). The doors are rolled between the spot-welding electrodes for successive welds.

Arc Welding

Manual and semiautomatic arc welding is the most prevalent type of welding in and around the 18,000 sq ft factory. The oil storage tanks previously mentioned are all manually arc welded using roller-equipped fixtures. The tanks are rotated on the rollers so that the weldor is always working at the top part of the work. In Fig. 6, a seven-barrel underground tank is being manufactured, using a 190-amp current with 3/16-in. electrodes. The weldor stands on the floor when he welds the smaller tanks but climbs up on top of the larger tanks and kneels.

The fish barges and larger barges for the Army are assembled next to the factory, which is located adjacent to the Lake Washington ship canal. Having a canal at your back door can come in handy. Once the company built a new pilot house on a steel tug right in the water, and the workers didn't have to go more than a few steps. On more than one occasion, big tanks have been rolled down the lawn and put on a barge against the bank.

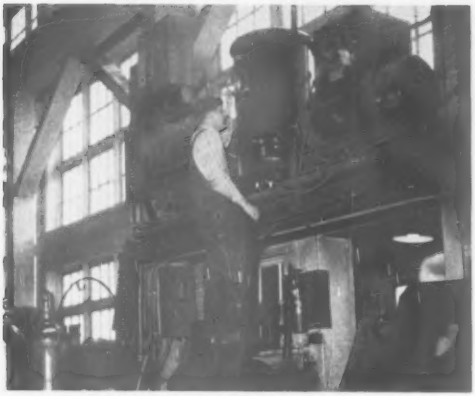
To look at a different type of work, the vacuum receivers and alcohol stills ordered by the chemical industry, and tanks and vats required by the pulp and paper industry, are of extra-low-carbon stainless steel and must be welded with type 316 ELC electrodes.

The company's material-handling equipment goes up to a 10-ton crane and hoist. Work-holding is another big problem. Sometimes simple C-clamps suffice; propeller guards for fishing boats constitute a good example (Fig. 8). Larger clamp arrangements are used on the tanks and cargotainers.

A look-see at cargotainer fabrication may be worthwhile. These antipilfering steel boxes can hold up to 1,200 lb. They are made so that they can be picked up by fork lift truck from the front, back or side. They can also be pulled on skids (welded to the bottom) or hoisted by cables attached to lifting hooks (welded to the top) and swung aboard ship by crane.

Cargotainers are made up of panels. The sides and back are formed by two panels of 16-gage steel (doors have already been discussed), and the top and bottom by seven panels of 14-gage steel. Six stiffeners are attached to each top. The four corner posts, to which the various panels are joined, are formed of 12-gage material.

In fabrication, spot welding is at first employed to join side panels to the corner posts and to join other sub-



7—WELDERS are kept on shelves—out of the way and yet accessible. The arrangement saves floor space

8—SERIES of simple C-clamps holds together the components of propeller guard to go on a fishing boat

assemblies. Manual arc welding is done when the subassemblies have grown too large for the spot welder. The sides, back, bottom and top are clamped together and tack welded, after which finish welding is done.

Figure 2 shows the welding of the side panels to the bottom, with the cargotainer right side up. A welding current of 150-200 amp is used, with 5/32-in. electrodes on the bottom parts and 1/8-in. electrodes elsewhere.

The procedure is to cut the cargotainer panels on the shear, form them on press brakes and then spot weld. The spot-welded subassemblies are held together by long clamps for arc welding. After top has been welded, the cargotainer is turned upside down by means of the overhead hoists and cranes so that downhand welding can be done on the bottom underside. The "boxes" are lifted to final assembly by overhead crane, and the entire assembly is manually welded. Chipping hammers are used after welding to clean off spatter and slag.

Inert-Arc Metal-Arc

Flohr & Co. was one of the first companies in the Pacific northwest to use the inert-arc metal-arc process. The company owns a manually manipulated welding gun, which is operated from a 300-amp welder. The welder is moved about by hand on a four-wheel steel wagon that also holds a cylinder of argon gas.

At present, the process is chiefly used to weld tanks to hold Diesel oil and fresh water for minesweepers (Fig. 3). These tanks are of aluminum bronze, to meet the requirement that all metals in a minesweeper be nonmagnetic (ship hulls are of wood).

Oxides on the aluminum bronze are removed by disc sander prior to welding. The aluminum-bronze wire and gas are carried to the gun through a flexible hose (gun can accommodate a maximum wire diameter of 3/32 in.). The gun can be manipulated to weld in any position; the weldor merely hits the trigger, and he gets welding current.

The company has found that this type of welding is three times as fast as manual arc welding. Thirty inches a minute are welded on the Diesel tanks, which are of 10-gage aluminum bronze. On heavier material, welding is naturally slower. A 0.045-in. wire (close to 3/64 in.) is used for all aluminum-bronze tanks.

Weldors like this process because of the absence of spatter particles and the ease with which vertical welding may be done. A sound weld is obtained without porosity. Another advantage is that welding speed is increased. Argon is preferred to helium for the shielding gas because the arc is smoother and there is practically no spatter.

The company, incidentally, has used this process for aluminum weldments, such as gangways of ships, with equally good results.

Tungsten-Arc Welding

The tungsten-arc inert-gas process, using a water-cooled manual electrode holder and a filler rod, is also employed with good results. This method of welding is particularly useful on light-gage stainless-steel sheets. Again, argon gas is used for shielding.

At the present writing, the company is engaged in quantity production of trays for freezing plants (fish). Aluminum sheets are cut out on the shear; the edges are bent in a press and the corners are welded by the argon-shielded tungsten arc. A simple slotted jig (Fig. 4) holds the parts upright so that the welds can be run flat. For the 0.056-in. aluminum sheet a 23-gage aluminum filler rod is used. Argon flow is nine liters per minute and current setting 70 amp. A high-frequency-stabilized a-c welder is used.

The weldor or his helper cleans the part thoroughly with wire brush or carbon tetrachloride before welding. Generally the parts are cleaned immediately prior to welding as the surfaces would re-oxidize if left overnight.

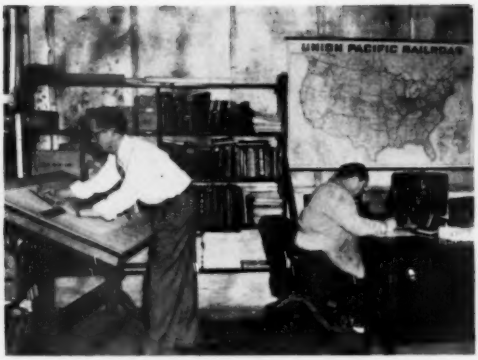
Welding on Barges

The same process is also used for welding stainless-steel piping for the pulp and paper industry, for welding Monel gasoline tanks and for the welding of steel and even copper parts. Although the process is not particularly recommended for welding copper, neat results have been obtained on such jobs as the welding of copper weather vanes where the welds do not need to be watertight.

The fish barges and larger barges

(Continued on page 62)

1–SUBCONTRACTING and research jobs are handled on a 100-kva flash welder. Note canvas spark shield



2—DESIGNING and figuring of costs are done for the customer who doesn't have necessary knowledge

New Service for Flash Welding

Those who lack equipment can get parts flash welded on contract basis. Those who lack know-how can get expert advice, up to and including product redesign.

BY W. C. HENZLIK

A MAN who hopes to do something about increasing the volume of flash welding is Ed A. Sirabian, president of Flashweld Industries, Inc., of Franklin Park, Ill. Sirabian has founded a new and different type of business.

The new company offers a four-fold service to its customers: (1) education in flash welding, (2) experimentation leading to product design or redesign, (3) contract maintenance and (4) contract jobbing. A word or two about each of these services might be in order.

Education consists in showing the customer how he can save time and money through the use of flash welding. If he's interested, then point No. 2 is in order. Without going to the expense of hiring special employees or setting aside laboratory facilities, a firm can set up a program of research, tooling or production at Flashweld.

Point No. 3, contract maintenance, covers keeping the customer's equipment in working order. It also includes regular check-up on machine settings to see that optimum production is being obtained.

No. 4, contract production, is for the man who needs only a limited number of flash-welded parts or components. Flashweld offers a special "package" deal that includes the cost of designing, the making of the flash-welding dies and the cost of labor and equipment time.

One of the biggest obstacles to use of flash welding, Sirabian finds, is that the men in charge are all too often scared out by its attendant requirements. Let's consider the matter for the minute from the point-of-view of a manufacturer of, say, metal furniture, a kitchen utensil or appliance, a lawn mower, a garden tool or any other light metal product. This product, whatever it may be, was designed to be joined by riveting or bolting or brazing or perhaps arc welding. The manufacturer is not wholly ignorant of flash welding. He once saw a flash welder in action, spitting off sparks, and he learned then that it was a butt-welding process. A quick look at his product shows no abutting surfaces—obviously, flash welding is not for him. But a simple redesign might be all that is necessary to effect startling production economies.

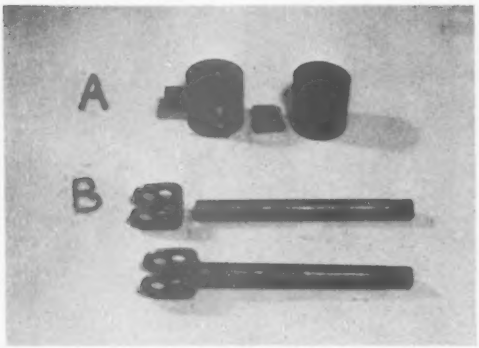
Perhaps design isn't the obstacle. Perhaps our manufacturer has been hearing tales about the costs of flash welders, how he will have to make special dies, that he will have to train a special operator, etc., etc. After a few hours of this—to heck with flash welding.

Big manufacturers—the steel mills, heavy machinery builders and equipment makers—are not much better. An engineer for such a concern will usually balance the possible profits to be attained from changing over to flash welding against his own time and effort and retooling necessary to do a good job on the redesign. About that time, more pressing problems of production, of maintenance, etc., have to be given immediate attention, and the flash-welding idea is shelved for eventual "reconsideration."

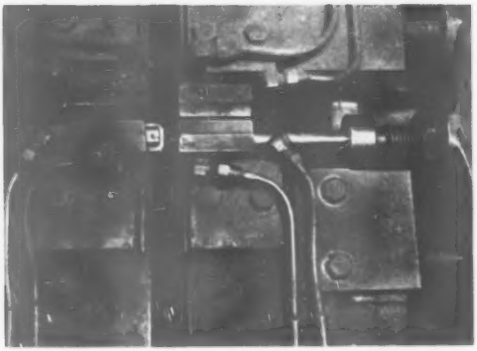
Where Sirabian Helps

By setting up Flashweld Industries, Inc., as a consulting, engineering and subcontracting business, Sirabian figures he can provide the answers for some of these gentlemen. He can offer 12 years' close experience with flash-welding problems as well as those of spot, seam and projection welding. Companies for whom he has worked include a large manufacturer of resistance welders, a firm making butt-welding tube mills and the largest bicycle manufacturer in the country.

Sirabian's new firm is located just outside Chicago in the western suburb of Franklin Park. Room for expansion and a power supply adequate for any requirements of the near future were the main reasons Sirabian



3—PRODUCTS designed for flash welding are an arm holder for a hay baler (A) and a handle assembly (B)



4—DIES for the strapping tool handle (B at left) are mounted in machine with components to be welded

decided to locate in this section. His power supply is taken from a 33,000-volt transmission line and fed through a bank of transformers that reduces the 33,000 volts to 440 volts, the voltage of the welding machines.

Equipment includes a 100-kva welder (Fig. 1), two 18-kva air-operated flash welders, an annealing and normalizing furnace and an air-compressor for plant air supply. A handily situated truck-bed-high loading platform opens into the working space.

When a customer is interested, Sirabian shows him samples of weldments he's made for other firms and suggests possible approaches to the problem before them at the moment.

Sample weldments are shown in Fig. 3. At top, "A" is an arm holder for a hay baling machine. The fabrication problem was to fasten the 3/16-in. thick formed stamping to the 1⅞-in. cylindrical mild-steel section. At "B" is a handle assembly for a steel strapping tool. The threaded bar was formerly arc welded to the perforated stamping. A faulty fillet weld here sometimes resulted in a break when heavy pressure was put on the handle. Injuries or burns to workmen resulted if the material being strapped had sharp edges or was hot, as in certain rolling-mill applications.

Some redesign was necessary to make the handle assembly suitable for flashwelding. The two components shown in Fig. 3 can be seen in their special dies in the welder, Fig. 4.

Other flash-welded jobs performed by Flashweld Industries are shown in Fig. 5. The long rods toward left center are ⅝-in.-diameter mild steel. They are salvaged from the short rod ends left after lengths of motor shafting were cut from mill lengths. The steel shortage at that time was such that flash-welding salvage paid off. To the right of the rods in Fig. 5 are flat galvanized strips of 16-gage steel fabricated for window display structures By flash welding these short ends of strip, the fabricator was able to get by on his steel allotment.

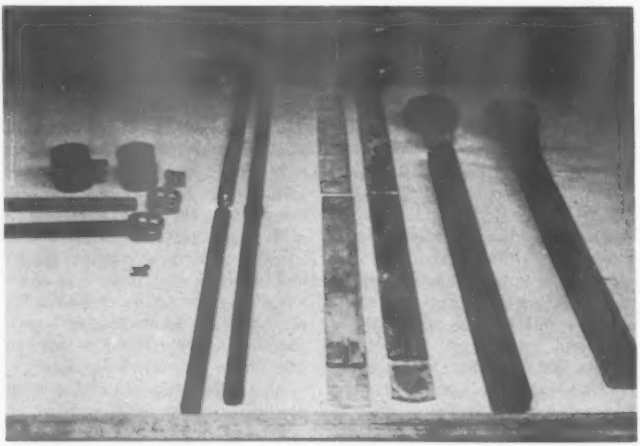
The heavy bars on the far right of the picture are elevating screws for Army tanks. The 1⅝-in. bar of 8640 steel is flash welded to a forged eyepiece.

Experimenting Required

For a good flash-welding job, the abutting faces must be of nearly equal area and shape. After the customer has seen one or two designs that meet with this requirement, he is apt to realize that an entirely new consideration has entered the scene.

Unless his product is a simple bar or strip assembly, the chances are that there will have to be some research on such factors as the proper alloy, the optimum current setting, adequate forging pressure, proper heat balance for each workpiece and the correct flashing speed.

Using modern metallurgical and welding texts as well as their collective welding experience, Flashweld personnel will draw up new designs for the customer's product (Fig. 2). They will fabricate it and then test the selected designs for the factors listed above until they find the one



5—SOME contract jobs. The long rods at left center are motor shafting to be salvaged by welding. Flat steel strips are for window display structures and heavy parts at right are elevating screws for Army tanks

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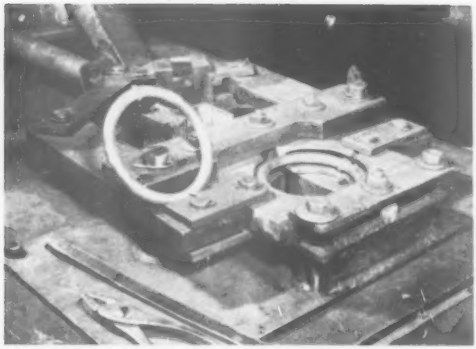

6—EGG-SHAPED parachute ring distorted by welding is returned to a circular outline by fixture at right

7—OWNER Ed Sirabian (background) takes a turn at the welder while a helper removes straightened rings

best suited to their requirements.

It Depends on Volume

Sirabian's work is just getting started when he has helped select and prove a good flash-welding design. Perhaps the biggest question between client and consultant has yet to be answered. This question is: How many weldments are going to be made?

Once he has learned the answer to this question, other considerations can then be adequately discussed. What type and capacity of flash welder is best for the job? Will special operating personnel have to be hired and trained? What about special jigs or fixtures for welded assemblies?

To all of these, the volume involved is, in most cases, the key. One company might use 500 flash-welded shaft assemblies a year. Another firm might require 50,000 ring assemblies. Depending on output per week, the latter case might well justify the purchase of a flash welder. Such a purchase might also require training of an employee to learn the art of flash welding so that the welder would live up to its capabilities.

The company who needs the 500 flash-welded shaft assemblies can secure them through Flashweld's job subcontracting service. The flash-welding dies necessary will be designed and made by Flashweld as well as any special jigs or straightening fixtures for the weldments.

The latter are sometimes needed to restore a flash-welded part to its design shape. Figure 6 shows (left) a ½-in. mild-steel ring for a parachute harness. As-welded, it is egg-shaped. This configuration is the result of material lost because of flash-off and plastic metal upsetting at the weld joint to shorten the circumference of the ring. An elliptical ring can't be used, however, so Sirabian designed a fixture (right of picture) that would efficiently restore the ring to a near perfect circle.

This fixture consists of an air cylinder linked to a reciprocating shaft that operates a circular compression die. The egg-shaped ring is dropped inside the expanded jaws of the die. When the air cylinder is triggered, the die pushes the long diameter of the ring back to the proper shape. The circular ring is lifted out of the die with a bar and pliers as shown in Fig. 7.

Subcontracting for the welding of such assemblies as the parachute ring has been a substantial part of Flashweld's business in its young life. Customers include many defense and consumer industrial people.

When the volume warrants the investment, Sirabian advises a client to buy his own machine. He gives him helpful information on the proper welder to buy, the electrical supply necessary for it, the preparation of workpieces and the training of operating personnel. Where a company so desires, Flashweld will assume the responsibility, under contract, of keeping the flash-welding machines and tools in good operating condition.

It's Still an Art

While not at all complicated nor hard to use, the flash-welding process does involve many variables. As mentioned above, these variables are line voltage, welding current, upset pressure, heat balance, flashing and upset time and characteristic and condition of fixture and machine. Each of these variables affects the weld quality. For best results, therefore, it is necessary not only to do a good job of tooling and starting a job off but also to maintain adequate supervision over the operation. Machine settings at the start of a run are not always good at its end.

Unfortunately, there is very little available at the present time in the way of instrumentation to serve as an adequate guide to weld quality. The operator, set-up man or supervisor must be able to recognize the variables involved and their relation to weld quality. In other words, flash welding is still an art and not yet a science.

In an effort to simplify the checking of production weld quality, Sirabian has been working on instrumentation that can be used as the machine is operating. He is attempting to establish a correlation between upset pressures, joint temperatures and weld quality. If such a correlation can be established, it should be a relatively simple matter to establish working zones for each job within which satisfactory welds could be expected. Sound or lights would then warn the operator, or signals picked up could be amplified to shut the machine down to avoid defective welds.

Work is going forward on this problem, Sirabian promises. He feels that success in this field will open the door to a new and more widespread use of flash welding.

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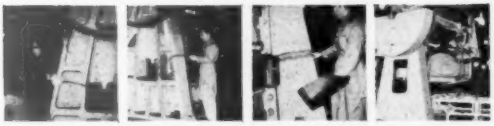

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"The folding press shown in the photos had been in service a great many years and during that time, cracked one leg of the side frame. Temporary repairs were unsuccessful and cracking of two other legs occurred, making the machine unusable.

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As recommended, we supported the weld repair by boxing in the complete side frame with steel plate and attaching the closely fitted plate to the frame with fitted bolts. The repair made in this manner was completely successful and the machine now operates as efficiently as a new unit.

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*Full name and address on request.

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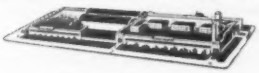

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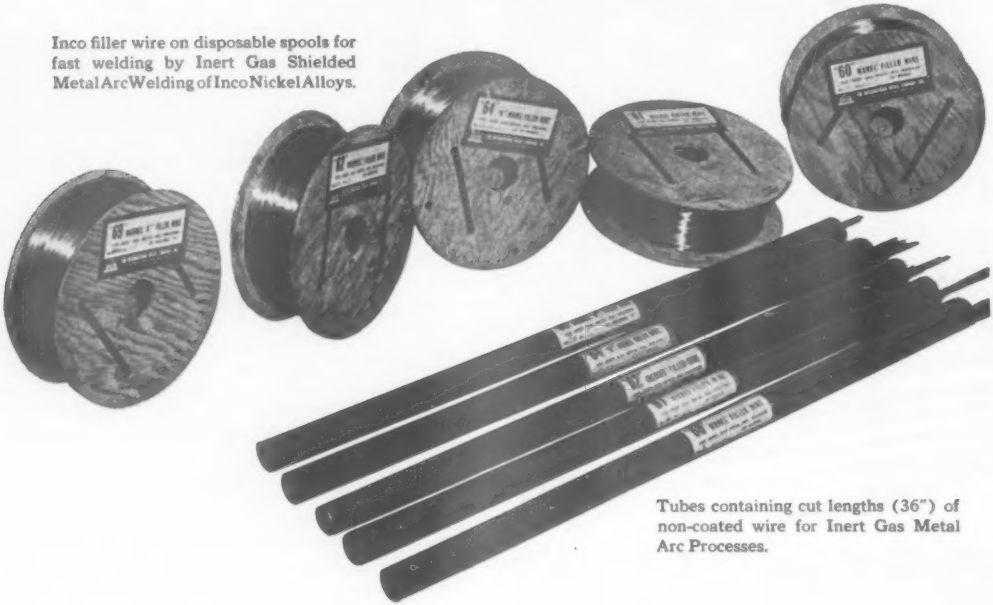

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The spools are supplied in wire diameters of .035, .045, and .062 in the Inco "60" series of welding materials.

For inert gas metal arc welding of Monel® you should specify "60" Monel Rod or Filler wire, for Nickel specify "61" Nickel Rod or Filler wire, for Inconel® – "62", for "K"® Monel – "64", for Inconel "X"® – "69".

Of course, like other Inco Nickel Alloy materials, filler wire is on extended delivery now. That's because so much is needed for defense. Therefore, it will pay you to keep in touch with your distributor regarding available supplies.

To help you determine which Inco welding materials to use for specific applications, Inco's Technical Service Section has prepared a Welding Materials Guide. It covers welding solid materials, clad materials, dissimilar metals and overlays. You can get a copy by writing directly to Inco.

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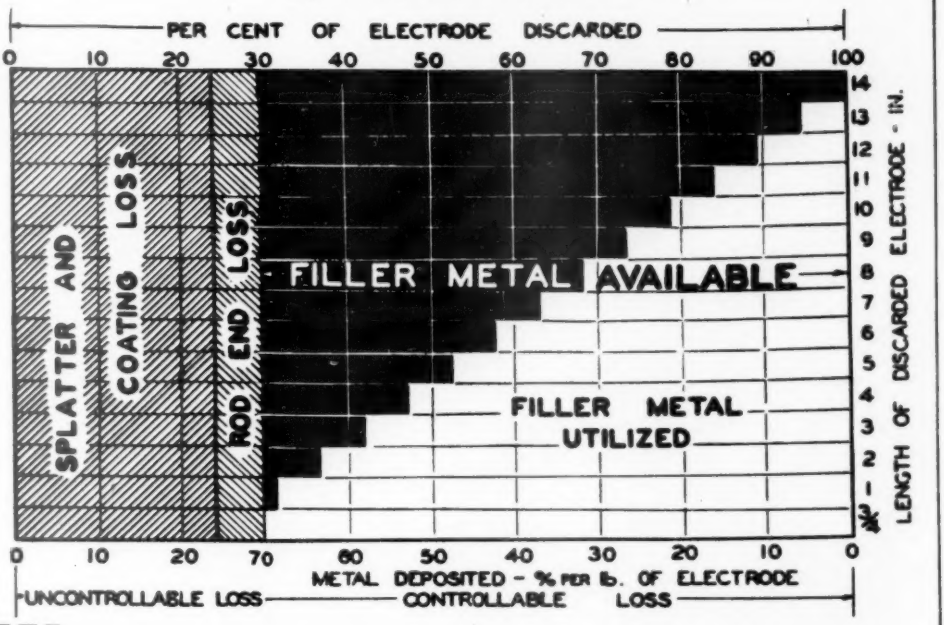
THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street, New York 5, N. Y.

What Per Cent of Your Welding Electrodes Do You Use?

By Ted Jefferson, Editor


PER CENT OF ELECTRODE DISCARDED
0 10 20 30 40 50 60 70 80 90 100
SPLATTER AND COATING LOSS
ROD END LOSS
FILLER METAL AVAILABLE
FILLER METAL UTILIZED
14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
LENGTH OF DISCARDED ELECTRODE - IN.
0 10 20 70 80 50 40 30 20 10 0
METAL DEPOSITED - % PER lb. OF ELECTRODE
UNCONTROLLABLE LOSS
CONTROLLABLE LOSS

WHAT PER CENT of your welding electrode do you use? Ask any weldor and the reply will be most likely "100 per cent" or "Practically all, 90 per cent at least." A trip through nearly any welding shop, however, will reveal that someone is mistaken. The miscellaneous assortment of varied length rod-ends to be seen on the shop floor will indicate that far from the maximum available filler metal is being obtained from each electrode, in some instances 40 per cent would be more nearly correct.

The above graph, which is based on actual results obtained from 3/16 in. heavily coated electrodes 14 in. in length, indicates that the maximum amount of filler metal that can be deposited with this diameter electrode is 70 per cent of the weight of the rod. This 70 per cent, the maximum, will be obtained only when the minimum rod end (¾ in.) is discarded. Since the average discarded rod end measures about 2 in. in length, only 64 per cent of the available filler metal is utilized.

It may be seen readily that the length of the discarded rod ends soon becomes an important factor in the cost of job unless their length is controlled and the losses kept to a minimum.

The natural question is "How can these losses be controlled?" In one instance, a shipyard, the weldors are required to turn in rod ends for new electrodes; as a result, the effective consumption of electrodes was increased from 56% to 65% for a saving of $7500.00 per year on their electrode purchases. Thus a 9 per cent increase in the deposit of the available filler metal in an electrode resulted in a 14 per cent reduction in the yearly electrode bill.

It should be remembered that the above graph is based on 3/16 in. dia. electrodes, for larger electrodes the losses would be less and on smaller electrodes considerably greater in proportion to size.

Reprinted from THE WELDING ENGINEER, *May, 1941*

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Aid or Trade?
A CRISIS AHEAD

A crisis in the foreign trade relations of the United States is in the offing. It is a crisis caused by:

1. Efforts of producers in friendly nations to earn more dollars by increasing exports to the United States, and
2. Efforts of industries in the United States which would be hurt by competition from these imports to keep them out.

· *This crisis is a threat to the effectiveness of American leadership in the crucial effort to build the nations of the free world into a strong and unified group.* It is the purpose of this editorial to advocate a constructive approach to the difficult situation that is developing.

Background of the Crisis

Most countries in the free world—with American aid—have managed to push their outputs well above prewar levels. As they have done so, they have been urged by our highest government officials to increase their exports to us. Sales in our market enable these countries to earn dollars which they use in turn to buy the products of America's farms and factories. Thus, as they become self-supporting, the need of American aid is reduced.

But as these efforts to export more to the United States have promised increasing success, competitive American producers have become increasingly alarmed about what that success might do to them. Consequently, they are seeking more protection—by appeals to the U. S. Tariff Commission to recommend higher import duties and by appeals to Congress for new laws to discourage imports.

Our Friends Protest

A year ago Congress answered one of these appeals by imposing a quota on imports of dairy products. Now, among many other legislative proposals being strenuously pressed is a move to extend the scope of "Buy American" legislation. A year ago the U. S. Tariff Commission had only four petitions for increased import duties on its docket. Since then fourteen more petitions have been filed and others are definitely on the way.

Faced by these mounting efforts to block the sale of their products in the American market, no less than eleven friendly nations, including Great Britain, France, Italy, Canada, the Netherlands, Switzerland and Denmark, have filed protests with our State Department. Through many of the protests runs one refrain. Although stated in diplomatic language, it might be correctly paraphrased to say: *"In*

sending us aid you have made it very clear that you want us to get on a self-supporting basis at the earliest possible moment. But, when we begin to make headway in that direction by trying to sell you more of the things we are equipped to produce, you start closing your market to us." The threat of European resentment against the United States being stirred up by this argument is obviously great.

At the same time there exist grounds for special resentment in the United States against certain prospective imports of European manufactured goods – those of machine tools, for example. In part these will be produced with machinery that has been sent to Europe as part of our economic aid program. With absolutely no diplomatic language involved, the argument, which will be extended much farther than the facts would justify, will run: *"We gave those people the equipment that they now use to cut our throats!"* This line of argument will find response among workers as well as employers in industries faced by more competition from imports. Labor, too, is keen for protection against more foreign competition.

Aid or Trade?

As between continuing direct economic aid to Europe or accepting the imports that would make those countries self-supporting, some would prefer to continue the aid program. They argue that the tax machinery of the federal government can spread the burden of aid broadly, while we have no comparable machinery that can cushion the shock to individual industries, firms and communities that may result from stepped-up imports of competitive products.

As we see it, this position is untenable. It would make rubbish of our Atlantic Charter promise ". . . to further the enjoyment by all States, great or small, victor or vanquished, of access, on equal terms, to the trade and to the raw materials of the world which are needed for their economic prosperity." It would be an admission that, for all our profession of faith in competition and our opposition to European cartels, we really don't believe in competition.

U. S. Self-Interest

The people of this country have invested billions of dollars and seven years of hard work in the attempt to put our allies on a self-supporting basis. If we keep their goods out by raising trade barriers, we are directly defeating our own purposes.

Also, in moving to protect some groups of American producers we should be hurting others. For many American producers the export market, which this year will take about $14 billion of civilian goods, spells the difference between operating at capacity and closing down 25% of their facilities. When we discourage imports we cut off dollar earnings by other nations which are spent here to keep some of our factories and farms going.

At the same time, it must be recognized that certain American industries and their capacity to maintain employment will be hurt by increased imports. Hence it becomes critically important for the United States to formulate a national program designed to help these industries and communities take up the shock.

There is no neat and simple prescription by which this can be done, but several possibilities have been suggested. One on which there is general agreement is that tariff reductions should be gradual. To cushion their impact, the government might well give preference on defense orders to industries and areas adversely affected by an increased volume of imports. Direct assistance to workers and companies in shifting to different lines of business may be worth consideration.

These are by no means all the possibilities. They may not even be the best. But they do serve to suggest the necessity for flexibility and imagination in dealing with the growing crisis in trade relations. *Our ingenuity in developing new ideas to meet this crisis may well be a decisive factor in our effort to weld the free nations into a strong and durable alliance.*

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SPECIAL frequency in new h-f inert-arc equipment doesn't interfere with radio and radar installations

Gas-Driven Welder

251 BOTH welding current and 110-volt, 60-cycle single-phase power are supplied by a new Westinghouse engine-driven welder. Named the EW-20, it has a welder rating of 200 amp at 40 volts and 60% duty cycle. Current range is 40 to 250 amp.

In off-welding periods, auxiliary power of 3 kw at 100% power factor or 2 kva at 80% power factor are available for lights and power tools. During welding, about 300 watts power is available for lights.

Coupled to a Ford, 4-cycle, 4-cylinder water-cooled industrial engine, the self-excited, compound-wound generator functions both as a d-c generator and a single-phase alternator for auxiliary power. Welding current is controlled in 4 ranges by a tap switch and shunt field rheostat. The a-c power circuit includes conventional outlets, a voltmeter, and a breaker with overload protection.

For high-speed road towing, two-wheel running gear is available for mounting on the frame.

WESTINGHOUSE ELECTRIC CORP., Pittsburgh 30.

* * *

Magnet Holds Gage

252 EASIER use of the ultrasonic "Audigage" thickness tester is claimed since the small searching unit has been fitted with a permanent magnet holder. The magnet assures good contact and prevents accidental shifting during tests. Bigger magnets can be installed in the searching unit where the material being gaged for thickness is cast iron or has thick layers of paint or scale.

BRANSON INSTRUMENTS, INC., Stamford, Conn.

* * *

Vertical Weld Grinders

253 TWO new Rotor vertical grinders are said to develop more power per pound of tool than any other vertical on the market. Utilizing magnesium castings, the heavy-duty model is only 7½-in. high; the light duty grinder is 7-in. high.

Steel wear plates are provided on the front of grinder to resist the hard wear verticals get at this point. The "dead" handle can be locked at either 90 or 100 deg from the "live" handle to suit the operator.

Both tools can be used as sanders with 7 or 9-in. sanding pads, 5 or 6 in. cup wheels or as a cut-off grinder. Speeds are 6,000, 5,000, 4,500 and 3,500 rpm.

THE ROTOR TOOL CO., Cleveland 12.

Cuts Radio Interference

254 A NEW high-frequency apparatus for inert-arc welding equipment is said to completely eliminate any radio interference problems. Like the spark-gap oscillator method, the new apparatus is used to superimpose a high-voltage, high-frequency impulse of current on top of the welding current to make arc starting easy. The h-f spark ionizes the air gap between a tungsten electrode and the workpiece to aid the flow of welding current.

Unlike the spark-gap oscillator, however, the new electronic h-f apparatus does not have to be shielded in any way to prevent interference.

The frequency used in the new equipment is completely removed from the domestic bands and lies within the narrow band of frequencies allotted to industrial users. A crystal control keeps it constant, as in an ordinary table radio. It is the only h-f welding equipment OK'd by the Canadian government for operation without radio interference.

CANADIAN LIQUID AIR CO., LTD., Montreal 1, Canada.

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255 THREE tasks, cleaning, de-rusing and phosphating, are performed by Oakite Compound No. 31. This liquid detergent can be diluted up to 25% by volume for economical

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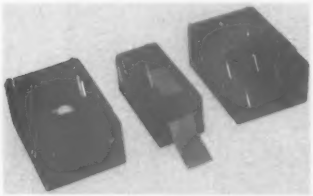


New Welding Analyzer

256 A NEW direct-writing "welding analyzer," Model B1-213, records single-phase and three-phase resistance welding machine variables. Welding current and electrode force are measured and recorded simultaneously, to show the important squeeze, weld, hold and off-time intervals.

Also recorded is the small 180 cycle per second component present in the three-phase welding machine current when ignitron rectifiers are used. Because the information is immediately available with this instrument, a welding engineer can adjust a welder while taking measurements.

Projection and seam welding machines can also be accurately checked with the new analyzer.

THE BRUSH DEVELOPMENT CO., Cleveland 14.

* * *

Rod Guards Manganese

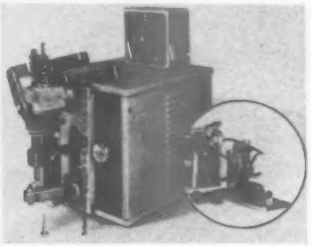
257 PROTECTING the protector is the role of the new Bergstrom "HFM 600" electrode for hard-facing new manganese steel castings or build-ups. Purpose of the hard-facing is to shield the surface of the manganese steel until it has work-hardened sufficiently to take care of itself. Heretofore, however, such surfacing didn't work out in practice. Reason was that most manganese alloys seemed to dilute or absorb the alloys in hard-facing rods.

Now, however, the "HFM 600" rod bonds at normal a-c or d-c heats to produce a high hardness coupled with high abrasion resistance on most manganese alloys. Beads or overlay may cross check but will not check or crack between overlay and base metal (exceptions may be encountered with some cast-base hard-facing overlays or those of the adhesion type). If separation occurs a bonding pass of "Mangaloy RX" should first be deposited.

The new rod is recommended for shovel teeth, drag line and rooter points, cement hammer mills and clay plant machinery.

INDUSTRIAL OVERLAY METAL, INC., Eaton, Ohio.

* * *



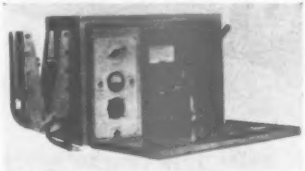
Resistance Soldering

258 NEWEST and biggest of the line of Joyal resistance spot welding and soldering machines is the Model 5000 WVS, equipped with timer. Capacities in various metals include: steel, up to 3/16 in. combined thickness; copper to bronze or copper up to 0.040-in.; brass to brass up to 0.080-in.

The electrodes are specially designed so that when closed they hold the work firmly. An automatic cut-off timer regulates the soldering time. An 11-adjustment heat control is provided.

JOYAL PRODUCTS, INC., Newark 3, N. J.

* * *



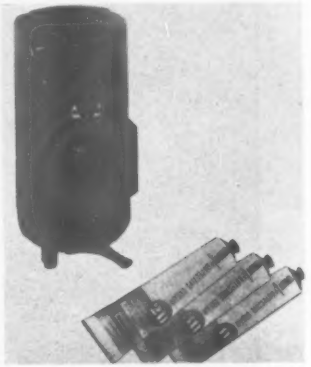
Surface Resistance Meter

259 WELTRONIC announces a new surface resistance indicator that tells directly in microhms how effectively a piece of aluminum has been cleaned. Though designed for aluminum, it can be used on other metals with low surface resistance.

It can directly measure the total surface resistance of two sheets, or coupons, when placed between the instruments two electrodes. (See left of cabinet). Besides the electrodes, the apparatus consists of a hydraulic pressure pump and gage, a tube-type d-c millivoltmeter, a resistance indicator adjuster and a d-c power source with suitable voltmeter and indicator bulb. The components are mounted and interwired in attractive gray hammer-finish cabinet 13-in. high, 20-in. wide and 10-in. deep. It is also available shock-mounted on a castered cart.

WELTRONIC CO., Detroit 19.

* * *



Protective Hand Cream

260 A NEW line of industrial protective creams shield the skin from certain bacteria and acid or alkali irritations. The creams are packaged in 12-oz tubes that fit into a specifically-designed dispenser. Pressing the lever on the dispenser produces a predetermined amount of cream for rubbing into the hands or other skin areas.

WEST DISINFECTING CO., Long Island City 1, N. Y.

* * *

Grinding Dust Collector

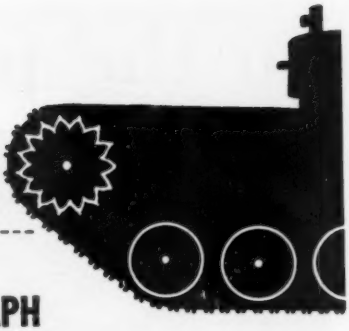
261 A LARGE-capacity dust collector takes up only 8 sq ft of floor space yet will collect the dust from 10 grinding wheels or abrasive belts in simultaneous operation. Its rated capacity is 3,630 cu ft of air per minute at a static suction of 6 in. measured on an 8-in. inlet pipe. Installation requires only the locating of the unit and connecting to electrical power and the piping system. The dirt-laden air is completely cleaned and returned to the working space.

AGET-DETROIT CO., Ann Arbor, Mich.

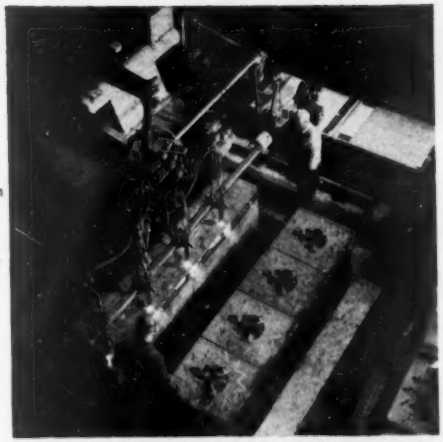
(More New Products on Page 87)

For more information on these products, fill in item numbers on cards, pages 17-18

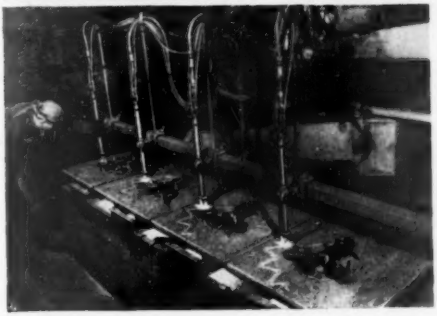
64 sprockets per day



AIRCO FOUR-TORCH TRAVOGRAPH CUTS FINISHED SPROCKETS!



The No. 50 Travograph in action. Inner circle and straight line cuts are done on rear table. The Electronic Tracer guides the arm movements automatically by following a low-cost outline drawing.



Outside pattern cut in progress on front table. Smooth, sharp-edged cuts make finish grinding unnecessary.

How to turn out tank sprockets to fit defense demands was quickly solved by the Otis Elevator Company. Installation of an electronically-guided Airco No. 50 Travograph Gas Cutting Machine in their Yonkers, New York plant was the answer.

Located next to the steel plate delivery entrance, Otis workers make quick work set-ups on their No. 50 Travograph, set a low-cost outline drawing under the Travograph's electronic tracer, and let the pantagraph arms guide the torches to work completion.

Torches are equipped with solenoid valves, operated by means of remote control switch which shuts gas off at work completion preventing contour-destroying notches . . . losing only torch gas — keeping hose lines full and instantly ready for next operation.

For your next production-run, large-parts job, where a machine-free finish is required on parts of any shape, it will pay you to consider the No. 50 Travograph. Whether you're cutting from plates, slabs, billets, or forgings, here is a precision machine that will cut identical parts on a profitable, quantity-production basis.

To obtain details about the Airco No. 50 Travograph for your operations, contact your nearest Airco office. Or just write and ask for Catalog 7, The No. 50 Travograph Gas Cutting Machine. Address: Advertising Department, 60 East 42nd Street, New York 17, New York.

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on the job

Courtesy National Cylinder Gas Co.

LIGHTER weight welders could be moved close to the welds in swampy terrain, eliminating long cable runs

Courtesy Detroit Stamping Co.

TOGGLE clamps cut down set-up time when adapted to fixture to tack weld the flanges of engine manifolds

Pipeline through Swamp

IN LAYING an 8-in. pipeline in northern Florida for the U. S. Navy, the Nichols Construction Co., of Miami, encountered difficult field conditions. Much of the 14½-mile line had to pass through swampy terrain in which welding machines of standard size and weight might have bogged down.

Nichols met the difficulty by employing three portable gasoline-driven d-c welders weighing only 385 lb each. These welders are mounted upon rubber tires for ease in maneuvering. They did not bog down and could be moved close to the welding operations (see picture), eliminating any necessity for stringing long cables to the job site. The portable welders were hauled to the job site in light trucks.

The three portable machines were operated by four men—three weldors and one helper. The helper's job was to move the machines to new locations as the work progressed. Since the welds were finished at different times, he had no difficulty in taking care of all three machines. The weldors, therefore, could devote all of their time to welding.

On an average, it took 18 minutes to complete a roll-welded joint, 20 minutes for one position-welded and 22 minutes for a joint in which bell-hole welding had to be done. The sections welded together in the field were 20-ft and 40-ft lengths.

According to George C. Mears, the construction superintendent on this job, the mobility of the machines and their comparatively low operating cost made a noteworthy contribution to the economies effected in this line. A single machine could operate all day on 8 to 10 gal of gasoline—about half the amount consumed by a standard-size machine.

The new line brings fuel from the Naval air station at Jacksonville, Fla., to a new jet plane base.

* * *

Weld Riveting

WORD comes from The Taylor-Winfield Corp., Warren, O., of an interesting process that joins two dissimilar metals by combining a spot weld with a rivet.

The Miles Mfg. Co., Cleveland, makes a plasterer's (or cement finisher's) trowel, which has a wooden handle with forged aluminum mountings and a blade of Swedish spring steel. The blade is attached to the handle mountings in this manner:

First, the blade and forgings are drilled with several holes. A flat-headed rivet of low-carbon steel is then dropped in each hole, and the assembly is placed in a jig on a bench spot welder. When the weld is made, the flat rivet head contacts the edge of the drilled hole to act as a ringlike projection.

After the slight burr left by the rivet head has been ground off, the trowel is turned over. The shank of the rivet, protruding from the aluminum forging, is cold headed. A final buffing makes it almost impossible to see either the weld or the rivet in the face of the trowel.

The weld heat has an annealing effect that brings the metallurgical characteristics of the two dissimilar materials close to a common wearing quality. Rivets and blade have been found to wear at about the same rate during the service life of the trowel.

* * *

Toggle Clamps on Fixture

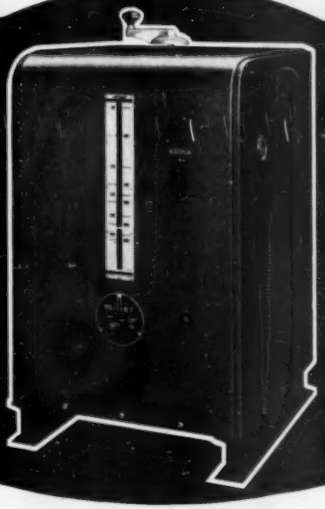
A FIXTURE that utilizes portable toggle clamps to hold an engine manifold for tack welding was designed by the Steel Cooperage Division of the Serrick Corp., Detroit. The fixture holds four rectangular and three round manifold flanges to an alignment plate during an inert-arc tack-welding operation. The parts are of stainless steel.

To provide additional gripping area on the manifold stamping, a V-type prong replaces one clamping jaw on three of the twelve toggle clamps on the fixture. Precise alignment is important because the flange openings must fit on machined engine-block studs.

The use of the portable toggle clamps has cut set-up time to a minimum, according to L. Mass, plant superintendent at Steel Cooperage. Approximately 54 manifolds per fixture are completed during an 8-hour shift.

After tack welding, the manifolds are transferred from this fixture to the final welding operation, in which the flanges are arc welded with stainless-steel electrodes. The manifolds are for Ford engines to go in reconditioned Sherman tanks.

SINCE 1929 **miller** SINCE 1929



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Every day MILLER 100 Series Heavy Duty Industrial A.C. Arc Welders prove their high efficiency in heavy duty and continuous production welding in all types of industry, shipyards, railroads, mills, job welding shops, etc. . . . they are the standard by which all other heavy duty welders are judged. There are models to meet your requirements . . . available in 7 sizes from 200 ampere-rated to 1500 ampere-rated . . . find out about them today.

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for Stainless Steel WELDING

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stable even at lower heats

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SELECTION...
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PAGE Welding Electrodes AND Rods

A. R. DIETRICH with mechanical cutting tool to trim flange edges

New Routing Fixture

By John Starr

BEFORE they are welded, flanges on the components of metal ducts and related parts have to be tediously trimmed with hand tools. That is they do in most factories, but not in the Northrop Aircraft plant at Hawthorne, Calif. Hundreds of dollars have been saved by a special rack and holding fixture that makes it possible to accomplish this type of work with a router motor.

A. R. Dietrich, a leadman at Northrop, designed a welded steel structure that supports the router motor and a vertical cutting tool. Parts are accurately aligned with the cutting tool by means of a small metal guide. The edge to be trimmed is rotated along the cutter as shown in the picture.

No adaptors are necessary to use this tool on parts of different shapes and dimensions.

* * *

Courtesy Linde Air Products

THICK SLABS of manganese steel are flame-cut for scrapping. Note crane set-up for heavy-duty torch

...after
nine years
steady use

practically
no
maintenance
expense...

STANDARD STEEL TREATING CO.
Harris Calorific Sales Co.
7401 Dubois Street
Detroit 11, Michigan
Gentlemen:
We thought it might be of interest to you to know that after nine years steady use we find it necessary to finally replace one of our #18 Harris Automatic Torches.
This torch is one of a number of this type in use in our straightening department and we can state without reservation that all have given exceptional service at practically no maintenance expense except for tip replacement.
Very truly yours,
STANDARD STEEL TREATING CO.
James D. Thompson, Gen. Mgr.

To the advantages named in Mr. Thompson's unsolicited letter, important as they are, we must add another that might not be obvious to those who have never used a Harris Automatic Torch. That is, in nine years of continuous operation the thumb control lever (circled at right) must have been actuated many thousands of times. Each and every time it saved money. Using it to restore the full flame from pilot light eliminates the time, motions and gases wasted in flame adjustment of a standard torch. Using the thumb control to shut off the full flame saves oxygen and acetylene that is wasted when the full flame burns but is not applied to work. All these things combine to yield a tremendous return on torch investment.

Harris Distributors, located in all principal Cities, are at your service. There's no better time than now to act!

THE HARRIS CALORIFIC COMPANY

Cleveland 2, Ohio

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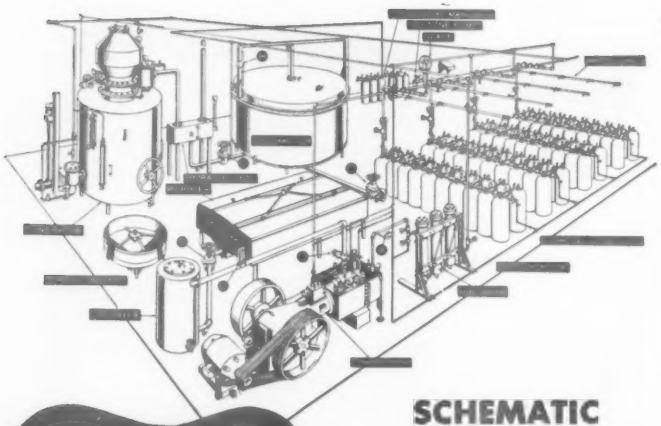
SERVING THE METAL INDUSTRY SINCE 1905



A *Low Pressure* ACETYLENE PRODUCING PLANT that Charges up to 160 CYLINDERS at ONE TIME

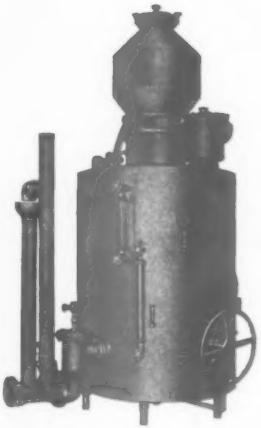
SCHEMATIC PLANT ASSEMBLY

SHOWING LOCATION OF UNITS THAT MAKE UP THE PLANT

This plant layout provides simplest operation at low production costs. Compact design allows operator to watch all operations at all times.

LOW PRESSURE GENERATOR

This 600-lb. acetylene generator fits into the above plant assembly. It stands out as one of the safest plants manufactured. Automatic controls minimize operating personnel. Rated capacity of the generator and plant assembly is 2700 cu. ft. per hour. The other units are designed for maximum production at minimum costs.



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O'FALLON 5, ILLINOIS

DIVERSIFIED WELDING

(Continued from page 44)

for the Army are both manually and semiautomatically arc welded. A "squirt-gun" welder is used for the semiautomatic work. Final assembly is done adjacent to the Lake Washington ship canal so that the barges can be slid down into the waterway when completed. Smaller barges, it perhaps should be noted, are launched by floating crane instead of ways.

Barge making is simplicity itself, at least in theory. Sizes of the steel barges differ. A fish barge rated as "medium size" is 60 ft long, 18 ft wide and 4 ft 6 in. deep.

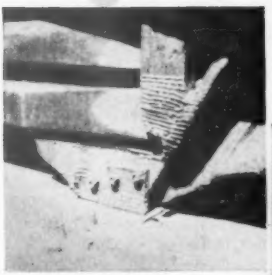
The ¼-in. plates from which the hull of the above barge is made are trimmed to the proper size, and the plates for the bow and stern are rolled to shape. In addition to the hull plates, some 32 cross frames and three transverse bulkheads are needed to make this size of barge. Wedges and dogs are used to align the various components, which are then tack welded together.

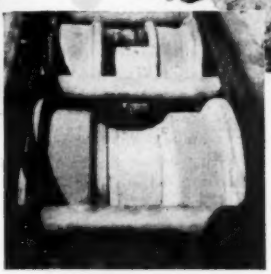
Finish welding is done by both manual and semiautomatic methods. Manual welding joins frames and bulkheads to the bottom shell, along curved surfaces, etc., where semiautomatic welding would not be feasible. A 600-amp d-c welder (average current setting about 360 amp) is used with 5/32in. E-6010 electrodes.

The semiautomatic method employs the same 600-amp generator with a current setting of about 360 amp. This method is mainly used to join deck plates, where long, straight seams can be obtained. A flame-cutting machine carriage (Fig. 5) was converted to carry the welding head so that welding equivalent to fully automatic welding is obtained from the semiautomatic equipment. A speed of 24 ipm can be obtained.

Semiautomatic welding requires less edge preparation than straight manual welding. In hand welding, the plates to be joined would need to be beveled. Beveling is not necessary with the semiautomatic head. A 5/64-in. rod is used with regular submerged-arc flux.

When a barge is completed, the big double doors at the end of the building are opened up, and the barge is pushed down skids into the canal with a splash . . . another example of a welded product turned out by Flohr & Company.





In addition . . .
VICTORALLOY cuts rod cost and reduces welding time 25 to 50%.

Tractor-Scraper Parts rebuilt with

VICTORALLOY

outwear new parts

2 to 1

HERE'S HOW:

VICTORALLOY is an all-position rod . . . vertical surfaces, end bits, blades, etc., can be hardfaced in position.

High burn-off rate, 6 lbs. per hour, speeds application.

One pass with VICTORALLOY'S high, rounded bead deposits as much metal as most rods do in two passes.

No slag interference—you eliminate chipping and cleaning.

Try VICTORALLOY NOW. Order a supply from your VICTOR dealer TODAY.

VICTORALLOY is designed especially for track rollers, idlers, grousers, end bits, cutting edges, tamper feet and other parts subjected to continual abrasion and severe impact. Its high chromium content produces a hard, polished finish that reduces friction . . . and doubles working life.

Write for literature on complete line of hardfacing alloys by VICTOR. Dealer inquiries invited.

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Welding and Cutting Equipment Since 1910

VICTOR EQUIPMENT COMPANY

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REDUCE COSTS
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PACIFIC SPOT WELD INSERT TIPS

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Don't remove the shank just replace the tip!

Internal taper engineered for maximum cooling.
Tips available in all shapes and alloys. Class I-II-III
Shanks available in all lengths and types.
Smooth insert shaft, watertight fit, with maximum electric conductivity —no contact resistance.
Tips easily changed without removal of shank for all different types of work.

PACIFIC TIPS – the replaceable spot weld tips that are irreplaceable! Accept no substitutes! Gives finest performance at lowest cost . . . saves money and time . . . saves critical copper. Reduces machine down time, wear and inventory. PACIFIC shanks fit standard Morse Taper Holders. Scientifically designed for machine or portable guns . . . straight and offset holders. Fully patented. Get information and prices today.

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Inquire for distributor and dealerships.

STEEL WELDED BY INERT-ARC

(Continued from page 23)

regulates it to within 0.1 volt.

The other welder is used in production on an entirely different type of job—expansion joints for an oil-refining assembly. The job includes the joining of low-alloy pipe 18 in. in diameter and ½ in. thick to a stainless-steel bellows 0.078 in. thick. In Fig. 2, a weld between the low-alloy and the stainless steel is being examined under a magnifying glass. Like other welds produced by this process, it has an exceptionally smooth and even contour.

The operator in Fig. 3 is engaged in welding an 18-in. bellows-type expansion joint. Note how the welding wire feeds down from the reel at the top, giving the look of submerged-arc welding.

Cost Savings

One of the new welders has taken the place of eight manual weldors on a particular application. The new process welds heavy metals at a rate more than ten times the linear speed obtainable with manual welding. Manual electrodes cost about $1.80 per lb., whereas welding wire of the same diameter costs about 32c per lb.

Solar's new equipment is adaptable all the way from very light to very heavy welds and from small parts of ½-in. diameter to pipe joints 10-ft in diameter. Welding wire sizes range from 3/64 to 5/16 in., and a variety of five wire compositions are used.

The inert gas that shields the arc is argon. Since no flux is used, there is no slag-removal chore. Moreover, distortion is kept to a minimum because heat input is limited by the high welding speeds employed.

Oxygen Makers Meet at Colorado Springs

Largest attendance in its 10-year history marked this summer's annual meeting of the Independent Oxygen Manufacturers' Association June 23-25 at the Broadmoor Hotel, Colorado Springs, Colo. Delegates numbered 125, representing companies in the U. S., Canada, Mexico and the Hawaiian Islands. Technical papers were read and open discussions presented on subjects of concern to the compressed gas industry.

THE MASTERSINGERS OF NUREMBERG

besides practicing their crafts cultivated the noble art of singing and an entire nation took an interest in their festivals.

Today nobody cares what masters do in their spare time. Yet the all-important question is whether they can do precision work in the shortest possible time.

Wherever iron and steel is to be cut and wherever progressive men are at work they will advise you to substitute the old hand flame-cutter by MINIMOR, the flame-cutting machine. MINIMOR is used on building-plots, storage - yards and work shops. MINIMOR saves costly hours by doing *the work in half the time.*

MINIMOR

[Ask for prospectus No. 13B]

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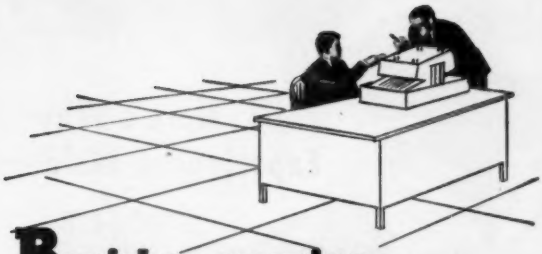

Banishes warping . . . eliminates grinding for Stainless Tank Producer

PROBLEM: Unusually severe warpage and the need for extensive grinding of welds resulted in a poor-looking job and excessive costs for a Philadelphia metal products company making stainless steel tanks for photographic developing. Tanks were of 16 ga. sheet, 48" x 36"—sides were bent up 90°, 18" inward from each edge to leave a 12" bottom—ends were being tacked in place and arc welded with 3/32" electrodes at 70 amps.

SOLUTION: M&T's district welding salesman—after studying the production set-up—

(1) Recommended use of inert-arc welding instead of metallic arc welding

(2) Designed and helped build a water cooled copper jig. Tanks could then be fabricated by placing them upside down on the jig, clamping an end in place, and starting to weld at the upper left hand corner, continuing across to right hand corner—and down to the right side. The left side was then welded from the top down. Next, the tank was turned around and the same procedure was repeated on the other end. 1/16" tungsten at 40 amps DC were used for welding.

RESULT: Warpage eliminated—grinding unnecessary—clean, flat, *almost invisible* welds obtained—costs brought into line.

Your nearby M&T representative is qualified to give you genuine assistance on any welding problem. Call on him when you need help. Make use of his broad background of experience in every phase of welding.

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Arc Welders • Accessories

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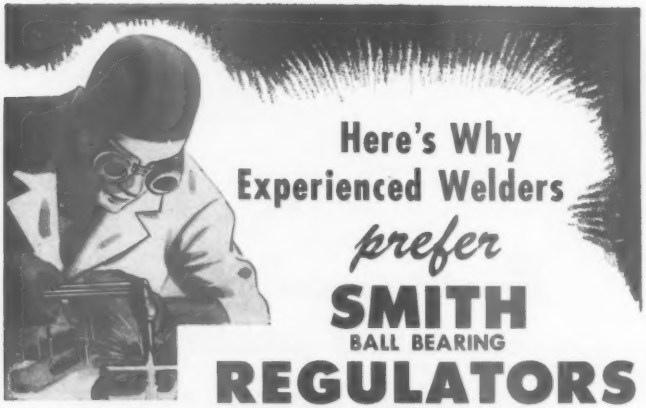
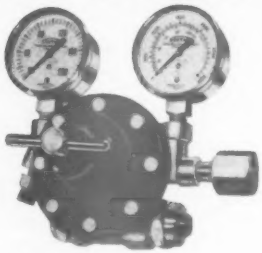


Here's Why Experienced Welders *prefer* SMITH BALL BEARING REGULATORS

FOR WELDING AND CUTTING:

1. Smith Regulators give accurate, dependable, trouble-free control of gas pressure.
2. Simplified design with no complicated mechanism . . . no delicate short-lived parts.
3. All parts easily accessible for quick cleaning, adjustment or repair.
4. Low cost maintenance and long years of service.



A favorite for over 25 years

Single Stage or Two Stage . . . . SMITH REGULATORS are DEPENDABLE and require less maintenance.

This is precision equipment, based upon years of practical experience in the business and built to give years of service. Best proof of consistent satisfaction is the wide-spread popularity of Smith Regulators from coast to coast. This acceptance has been *earned*—on the job. One thing welders like is the ease of making repairs when necessary. It takes only 10 minutes to change a seat, 15 minutes for a new nozzle and 20 minutes for a diaphragm. No special tools necessary. No long delays. Smith Regulators keep production rolling.

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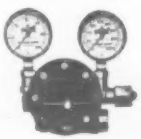
Smith's Type BB Single Stage Regulators (Oxygen and Acetylene) provide an even delivery of gas for general welding and cutting. They are the old standby of the Welding Trade for 25 years.

Smith's Type BB-2 Two Stage Regulators soften the drop from high cylinder pressures to operating pressure without fluctuation for all types of welding and cutting as well as hard facing and alloy welding. Keeps torch flame at same adjustment without variation until torch is shut off. Smith also makes Line Regulators, Hydrogen Regulators, Air Regulators and other special purpose regulators. Write us for further information.



Type BB-2 Two Stage

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Please send me full information on SMITH'S Ball Bearing REGULATORS.

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INSIDE AND OUT

(Continued from page 37)

do all the welding on the entire big tank. A saving of 75% on filler metal was estimated to have been effected from the slow hand-feeding method required by older processes.

The seams were welded in one pass from each side of the aluminum plate. Most of the joints were square, with no edge preparation necessary. Welding of the roof of the tank to the side (and bottom to the side) required fillets, as did the manhole and some fittings.

Two men did all the welding on a tank. The fabrication time was approximately 200 hours per man—400 man-hours per tank—amounting to about half the labor needed for older welding processes.

From Top to Bottom

Procedure for erecting each tank involved the following successive steps:

(1) The top course of the tank (made of four sheets) was fabricated. A structural angle was put around the upper edge of the top course. The roof frame was fabricated and added to the top course. The roof plates were stitched together to rough shape, then trimmed to size and installed.

(2) The second or middle course was fabricated. The top course was lifted, the second course placed beneath it and the two sections were welded together.

(3) The bottom plates were stitched together to rough shape, then trimmed to size. The bottom course was fabricated and welded to the bottom plates. The manhole and fittings were installed in the bottom section. Heating pipe (aluminum, 2-in. iron pipe size) was cut to length and bent in the shop for installation in the bottom section. The two upper courses were lifted and the bottom course inserted beneath it; then all were welded together.

The successful example provided by this operation should encourage the fabrication of aluminum tanks by companies concerned with the storage of liquid chemical or food products. Use of aluminum promises to bring about many improvements, both in methods of tank fabrication and in the quality of the products preserved and protected for the consumer.

FOR LOW HYDROGEN ELECTRODES

Weldrod coatings with TAM Ruflux T increase the speed with which a slag sets up while providing better slag control. Ruflux T is a compound containing approximately 91.5% ZrO and 5.4% SiO_2. Mesh size is approximately 0.1% on 325 mesh. Detailed information is easily obtained by writing our New York City Office.

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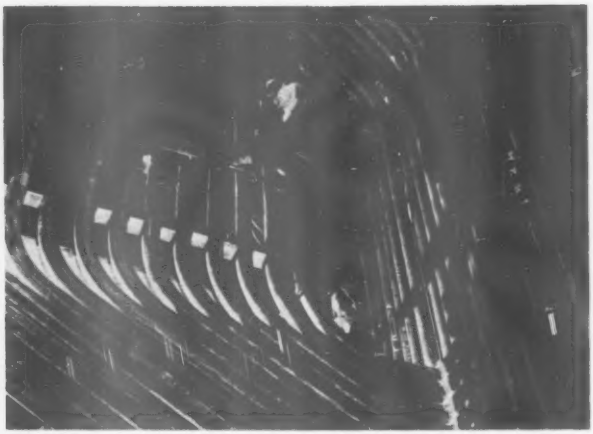
MONSTER band saws, 50 and 60 ft long, are welded with atomic hydrogen set-up.



SURROUNDED by maze of boiler tubing, this weldor puts finishing touches on boiler at Goodrich plant at Akron, O. Tubes are 38-ft high

NEWS

Dangerous Ore Loss in Steel Strike

BOTH steel production and steel employment will be seriously affected next winter by the current ore and steel strikes, according to Mr. Elton Hoyt, II, senior partner of Pickands, Mather and Co., Cleveland, a large ore producing company in the Lake Superior district.

Idle ore-boats are causing a loss of 200,000 tons per day needed for the winter season when all shipping on the Great Lakes is ice-locked. To date, shipments of iron ore to lower lakes steel mills are about 13,000,000 tons less than shipments for the same period in 1951. Moreover, the requirements for iron ore are greater this year owing to the addition of new furnace capacity.

About 7,000,000 tons of ore were stockpiled in the upper lakes at this writing. An effort was slated to secure the cooperation of the steelworkers' union on shipping this down the lakes to the unloading docks of the various steel plants.

* * *

Simonds Band-Saws Atomic-Hydrogen Welded

BIG band-saws, some 50 and 60 ft long, travel at express train speed and may bend as often as 440 times a minute. Best method to join the fabricated blades into an endless loop is by atomic-hydrogen welding, says Simonds Saw and Steel Co., Fitchburg, Mass. (left photo, above.)

Also necessary for good band-saws are selected saw steels made from special alloys. Custom filler rods are used with the atomic hydrogen welders, according to General Electric Co. During the last 7 or 8 years there have been no reports of a weld breaking while a saw was in operation.

* * *

Three Firms To Make Wulff Process Acetylene

AGREEMENTS with the Lummus Co., New York; The Fluor Corp., Ltd., Los Angeles and the Girdler Corp., Louisville, have been made by the Wulff Process Co. under which these firms can design and construct plants for making acetylene and etheylene by the Wulff process.

A commercial size pilot plant in Maywood, Calif., has been operated by Wulff the past 18 months. During the last nine months the plant has been in continuous commercial production of acetylene. Wulff is now prepared to license the process for large scale commercial use.

The process uses natural gas, ethane, propane, butane or any liquefied petroleum gas mixture as feed stock and produces low-cost acetylene. It may be applied to plants making as little as one ton per day or as much as 100 tons per day.

* * *

Jungle of Steel Tubes in Ohio Power Plant

A MAZE of steel tubes was fabricated for Ohio's newest, largest spreader stoker fired steam generating boiler. Steam will be used to generate power for the B. F. Goodrich Co., Akron, O. Where the weldor (right above) is doing some last minute work, flames will soon lick at a heat of 2,000 to 2,500 F. Rating of the boiler is 200,000 lb of steam at 250 psi at 525 F. Height of the steel tubes is 38 ft.

* * *

Lithium Production To Stay High

THE supply of lithium oxide, used in welding fluxes and electrode coatings, will remain high, says the Defense Materials Procurement Agency. A production goal of 50,000 tons of spodumene, principal source of lithium oxide, annually by 1955 has been set up. Domestic reserves of spodumene and other lithia-bearing ores are ample.

Members of the Spodumene and Lithium Ores Business Advisory Committee are: William J. Murphy, American Potash and Chemical Corp., New York; Freemont F. Clark, Lithium Corp. of America, Inc., Minneapolis; Gordon M. Chambers, Foote Mineral Co., Philadelphia; and Albert J. Turner, Maywood Chemical Co., Maywood, N. J.

Welded Lathe Bed Absorbs Shipboard Shocks

PRECISION lathes mounted on Navy ships have usually been somewhat shaken up by the continuous deck movement and by the shocks of gunfire. To provide a rigid and sturdy Naval mounting, the Reed-Prentice Corp., Worcester, Mass., has recently built an engine lathe with a welded steel bed and welded steel supports. It has passed the Navy's specifications for output and accuracy.

The tests were conducted on the lathe without preparing foundations, leveling or anchoring. Thus was it shown that the mountings are adaptable to certain dry land installations as well as shipboard use. It would be useful in factories where it had to be relocated frequently and readied for productive work without delay.

Advantages secured by welding were said to be 1) greater rigidity than is provided by a comparable cast iron bed and 2) a design in which supporting members could absorb and dissipate forces causing deflection. The bed design is an adaptation of triangle principles, having welded back and front walls connected by diagonal plates, and reinforced by vertical cross plates.

Supports are steel legs which rest on three cushioned ball and socket bearings. In addition to supporting and anchoring the bed, they also block transmission of motion and strains to it.

* * *

Eutectic Sends 50,000th Photo of "Miss Welder of 1952"

MORE than 50,000 pin-up photos of Denise Darcel, French and American movie and stage actress, and "Miss Weldor of 1952" have been sent to welding men. The 50,000th photo was presented to Harold S. B. Hager, melting technician at Corning Glass Works.

A glossy 8 by 10 photo of Miss Darcel will be sent free to weldors requesting it from Eutectic Welding Alloys Corp., 172nd St. and Northern Blv., Flusing, N. Y., N. Y.

* * *

New Orders shoot Ryan Backlog to $70,000,000

NEW contracts obtained recently have increased Ryan Aeronautical Co.'s backlog to more than 56 percent over last year's. Last year's orders-on-hand amounted to $30,000,000 and those of two years ago numbered $6,000,000. Recent added contracts totalling $25,000,000 have brought this year's production orders to over $70,000,000.

- Circular design — essential to uniform heat distribution
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- Sturdy reinforced-welded sheet metal construction
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DryRod—always made by, and now also sold by PHOENIX

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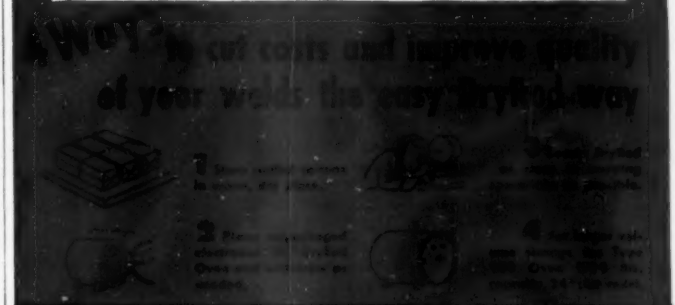

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Reference to this booklet will speedily solve common welding engineering problems for both the engineer and the weldor. Each alloy is described in detail and nothing, therefore, is left to guesswork.

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This *POCKET SIZE WELDING ENGINEERING GUIDE* will be helpful to you. Write for your copy.

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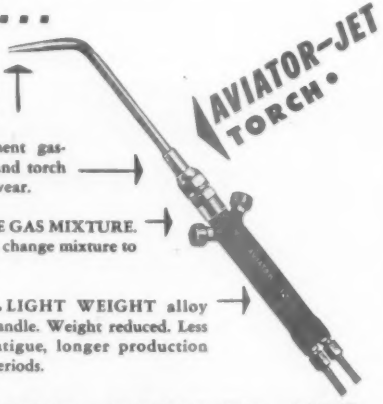

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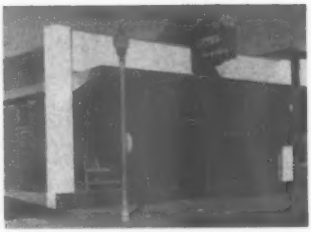


Fresno, Calif., Store Opened by Victor

VICTOR Equipment Co. has broadened its service to welding users in the Fresno, Calif. area by opening a new store and warehouse at 145 Van Ness Ave. According to Al Dreith, Jr., branch manager, a complete stock of both oxyacetylene and arc welding equipment and accessories will be carried to meet every welding and cutting need.

* * *

Acton, Mass., Open House Held by Air Reduction

LOCAL civic and business leaders were invited to a plant open house at Acton, Mass., on June 28 by Air Reduction. Airco made its first appearance in Acton in 1949 with a small plant for the production of acetylene, but has since completed considerable expansion of facilities. Not only has the acetylene production been stepped up but a hydrogen producer and a liquid oxygen substation have been installed.

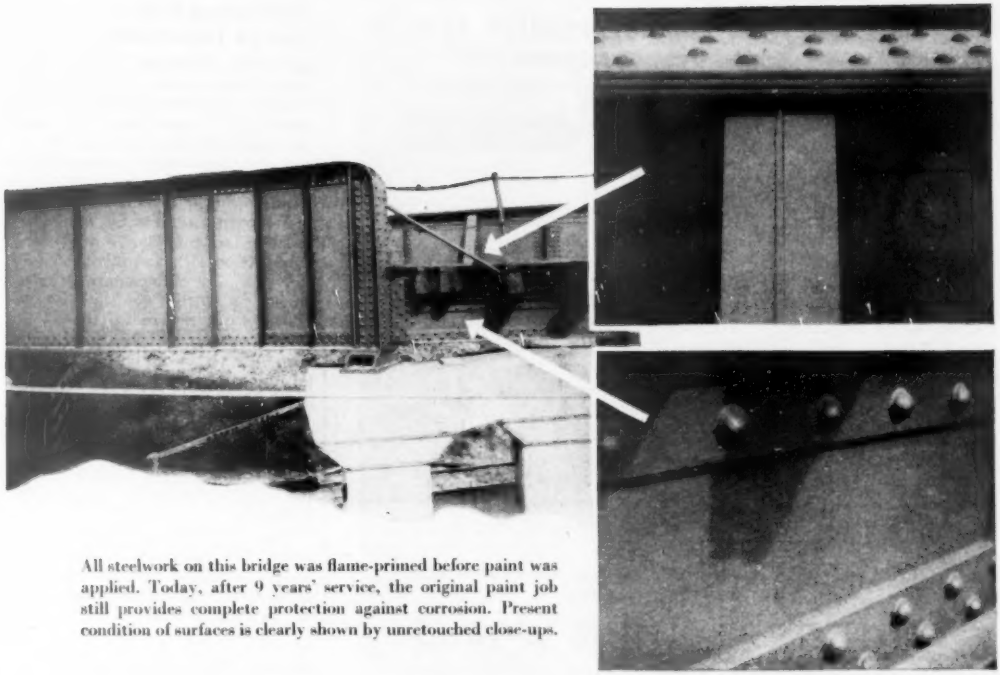
Guests were welcomed by A. S. Blodget, Jr., manager of Airco's Boston district. Following a guided tour of the plant, the visitors witnessed a series of demonstrations to show some of the many uses of Airco products. Liquid air came into play to start the show and was followed by oxyacetylene cutting and welding with the "Aircomatic" process. Also on view were exhibits of products made by other Air Reduction divisions.

Following the open house a reception was held at the Mail Coach Grill, Route 2, East Acton, Mass.

* * *

Seam-Welded Gas Tanks Stretch B-47 Bomber Range

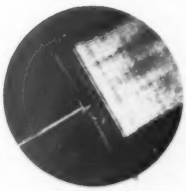
THE largest external fuel tanks ever built are extending the combat radius of the new B-47B six-jet bombers. These tanks are seam-welded in mass quantities at Ryan Aeronautical Co., San Diego, Calif., and shipped to the Wichita, Kansas, plant of Boeing Airplane Co., designer and builder of the plane. Speed of the older model B-47A was more than 600 mph.



All steelwork on this bridge was flame-primed before paint was applied. Today, after 9 years' service, the original paint job still provides complete protection against corrosion. Present condition of surfaces is clearly shown by unretouched close-ups.

Your Steelwork . . .

How Will It Look in 1960?



Steelwork you coat with good paint today can still look like new ten years from now, *if you flame-prime all exposed surfaces first.* And what you'll save on maintenance, because of increased protection due to flame-priming, will more than pay for all the flame-priming apparatus and materials you need for the job.

Flame-priming is simple to do, requires little equipment, and costs little. A brush of oxy-acetylene flames pops off scale and drives out moisture. Paint applied to the warm, dry surface goes on quickly and smoothly, bonds tightly, and lasts longer.

Flame-priming is one of many time- and money-saving LINDE methods for making, cutting, joining, treating, and forming metals. So, whatever you do with metals, there is a good chance that LINDE know-how, show-how, and equipment can help you do it better, more quickly, or at lower cost.

To find out, without obligation, telephone or write our nearest office today. LINDE AIR PRODUCTS COMPANY, a Division of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y. Offices in Other Principal Cities. In Canada: Dominion Oxygen Company, Limited, Toronto.

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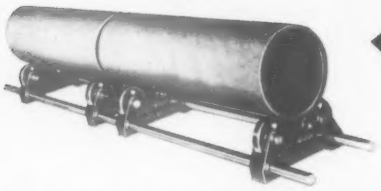

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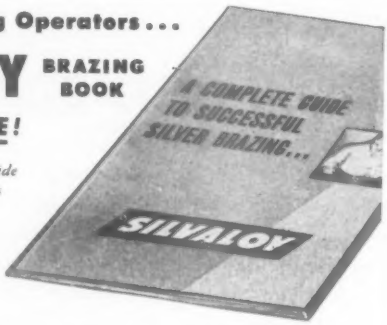

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Weld-Spliced Rods Save 70 Tons of Steel

BY welding reinforcing bars at splices in concrete columns, workers at the 165-bed Peninsula Hospital, Burlingame, Calif., saved some 70 tons of steel and more than $18,000. According to *Engineering News-Record*, more than 7,100 splices had to be made in the 1¼-in. diameter bars.

Welded splices for the bars saved 21 lb per slice which at 8 cents per lb saved $1.68 each. It's thought welding time didn't cut much into that saving. A further cost cut was possible because the welded splices permitted smaller column dimensions. Two inches were cut off the sizes needed for lapped splices.

Smaller corridor columns resulted in a decrease in transverse spacing of them and thus the floor areas required for corridors. Where column sizes changed, the welded joints cut down the need for bending column reinforcement.

The San Francisco firm of Stone and Molloy and S. P. Marraccini, associate architect, designed the hospital. Structural engineers were Adrian, Graham and Hayes.

* * *

Special Welded I-Beams Carry Railroad Traffic

GOING into the structure of the Mulberry Street railroad bridge in Baltimore, Md., will be 27 big specially-fabricated I-beams. Heavy plate sections are joined by four fillet welds to make 62-ft long beams that weigh about 9 tons each.

Submerged-arc welding at 750 amp d-c is joining method put to use by Maryland Drydock Co., Baltimore, according to Linde Air Products Co. The sections are first positioned in a special jig where manual tack welds are deposited to align the work-pieces. The automatic welding head runs on a portable carriage that travels on tracks alongside the weld joint.

* * *

Allis-Chalmers Builds Big Betatron Room

To house a new 22,000,000 volt betatron inspection machine, Allis-Chalmers is completing a 86 by 74-ft concrete building at the West Allis Works in Milwaukee. The betatron will be used to inspect weldments and castings going into A-C steam turbines, centrifugal pumps and hydraulic turbines.

The steel-reinforced concrete walls of the building are 6-ft thick and 20-ft high to shield operating personnel. The X-ray room is large enough to accommodate a railroad car.

Thor Tool Points Up Industrial Sales Effort

INDEPENDENT Pneumatic Tool Co., Aurora, Ill., has inaugurated a new Thor industrial sales division. Newly appointed sales people to head the new effort are J. A. Hill, manager of industrial sales; J. F. Corkery, manager of electric tool sales, and G. A. Thoma, sales promotion manager.

Mr. Hill is a 26-year veteran in the company's sales department, having served more than 20 years in application of Thor tools.

* * *

More "Ribbonrails" Installed by Railroads

PRESSURE-welded rails are being made up and laid on many right-of-ways these days, according to Oxweld Railroad Service Co., a division of Union Carbide and Carbon Corp. Oxweld's service and equipment are being used at the following locations: Chicago & North Western, West Chicago, Ill.; Boston & Maine, North Adams, Mass.; Central Railroad of Pennsylvania, Allentown, Pa.; Chicago & Eastern Illinois, Danville, Ill.; Norfolk & Western, Roanoke, Va.; Pennsylvania Railroad, Chambersburg, Pa.; Northern Pacific Railroad, Big Timber, Montana.

* * *

Quench Hardening Patent Given to Public

A PATENTED method for predicting quench-hardening characteristics of different steel alloys has been given to the public by United States Steel. The method consists of assigning carefully tested hardenability values to such steel alloying elements as carbon, manganese, molybdenum, chromium, nickel and others and multiplying such factors to arrive at a close approximation of the final hardness. The patent was issued last July in the name of Dr. Marcus A. Grossman, adviser in research planning for U. S. Steel.

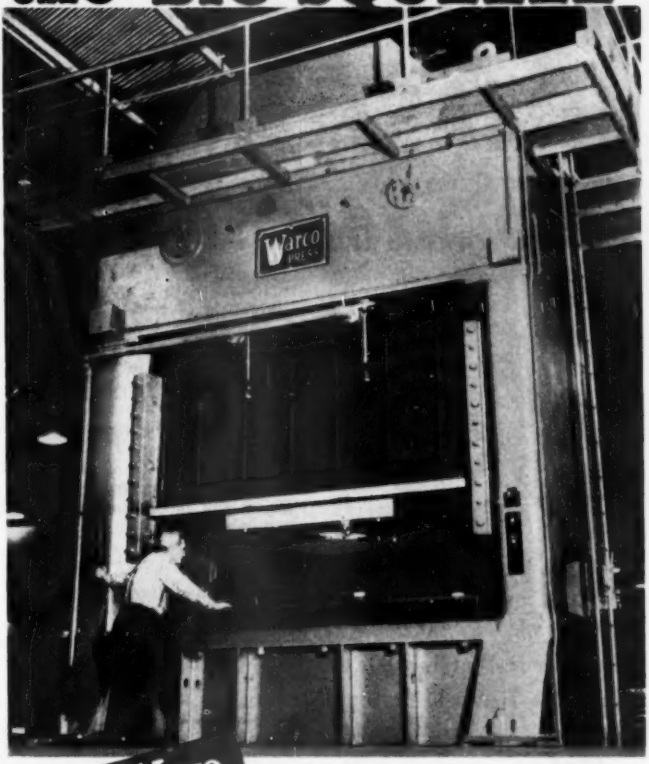
* * *

Worthington's Dunellen Plant Named Plainfield Works

NEW designation for what has been known as the Dunellen, N.J., plant of Worthington Corp. is the Plainfield Works. Since the plant is not actually located in Dunellen, its correct address from now on will be Worthington Corp., Plainfield Works, Plainfield, N.J.

Some 400 employees at this plant manufacture welding positioners, concrete mixers, truck mixers, road pavers, special industrial mixers and other concrete machinery accessories.

the 'BIG SQUEEZE'



GIANT Warco PRESS SPEEDS AIRCRAFT PRODUCTION FOR RYAN AERONAUTICAL

One of four huge new Warco Presses which represent the largest equipment ever installed at the Ryan Aeronautical Company. Ryan is using the presses to stamp out large aircraft components and initial tests point to an eventual savings of thousands of man hours and many tons of machined materials. Stainless Steel exhaust cones for jet engines were first to come off the new presses. Ryan found they could not only produce the pieces in a fraction of the time formerly required, but a number of machines normally used were free to perform other work. Ryan now plans to make further use of the flexible power of these Warco giants to streamline the production of combustion chambers, liners, aft frames and afterburner parts. Take a tip from this leading aircraft plant — look over the modern line of Warcos before you buy . . . you'll be further ahead in the long run.

Federal WELDERS

Warco PRESSES

THE FEDERAL MACHINE & WELDER COMPANY

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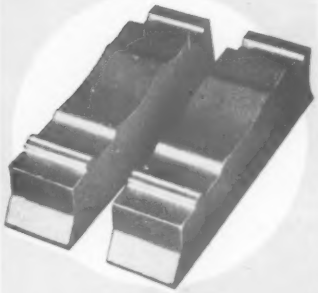

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West Coast Plant: Burbank, California

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*Reg. U. S. Pat. Off., Ampco Metal, Inc.

Big New Addition for Midwest Piping Plant

INCREASED demand for welding fittings has pushed the completion of a new 48,000 sq ft addition to the plant of Midwest Piping and Supply Co., Inc., St. Louis. According to A. G. Stoughton, president, the new facilities double the pressing and welding capacity and represent an investment of more than $500,000.

The most modern presses and handling equipment have been placed in the new section to make precision welding fittings. Equipment is now complete except for a press capable of producing welding elbows up to 36-in. in diameter. The press is being designed and built by Midwest engineers and constructors, and it is hoped will be in operation by the end of the year.

* * *

Big Chimney Stack Welded in Australia

SEMI-automatic welding saved considerable time and preparation expense on a 102-ft section of a 270-ft chimney recently erected in Australia. Erected for A. Goninan & Co. Ltd., of Newcastle, the welded section was made of 5/16-in. plate and was 11½ ft in diameter.

A special "high-density" arc welding process was used, according to The Lincoln Electric Co. (Australia) Pty. Ltd., enabling a welding speed of 28 ipm. The first pass was made from the outside of the rolled plates, strengthened from inside with stiffeners. Current for the root pass was 225 amp. The second pass was laid on top of the first at about 350 amp current. The third and final bead was deposited from the inside at 350 amp. Each circumferential pass took about 15 minutes or about 45 minutes welding time for a complete 11½ ft diameter welded joint.

Longitudinal seams on the stack were welded with the aid of a straight-line cutting machine mounting. For the circular seams, a telescopic shaft supported the welding gun in addition to the raising and lowering apparatus from the cutting machine.

Entire job took five eight-hour shifts, roughly a quarter of the time that would have been required for manual welding.

—McGraw-Hill World News

IN 4 SIZES

Yes, this popular wide vision, one piece, clear Lucite plastic, No. 39 Eye Shield, 92½% optical clarity by laboratory test, is now available in four sizes: 39-A, 4¾" lens. 39-B, 5" lens. 39-C, 5½" lens. 39-D, 6" lens. The 5½" lens should accommodate even the large shell rim prescription glasses but the six-inch lens is offered because of its extra roominess. We suggest ordering in standard dozen lots 2A, 4B, 4C and 2D.

This is an extremely comfortable eye shield which achieved instant popularity when first offered in the smaller sizes.

You Requested the Larger Size

Shop owners and safety engineers from the Atlantic to the Pacific, from Canada to the Gulf, have urged us to furnish this eye shield in the larger sizes for use with prescription glasses.

If you are a shop owner or safety engineer and if you are not already furnishing this eye shield to your workers, we urge you to order a few pair from your dealer for test purposes.

Remember this is an exclusive Sellstrom "Jumbo" Eye Shield. Be sure to specify "Sellstrom" when ordering from your dealer. If he cannot supply you, write us direct.

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MANUFACTURING COMPANY
Let Sellstrom Safeguard Your Eyes and Face
626 North Aberdeen St., Chicago 22, Ill.

To operate at spot welding forces up to 6000 pounds

New Mallory "*Premium*"

8° Heavy Duty Electrode Holders

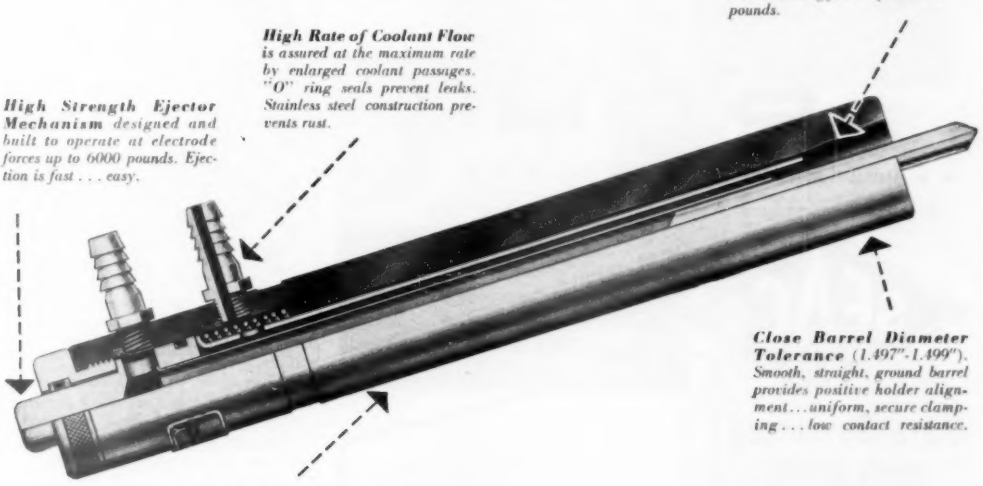
Latest addition to the widely-used Mallory line of leak-proof electrode holders, the new "Premium" heavy duty holders are designed to help you handle the higher electrode forces and welding currents required to meet the rigid specifications on military components.

Consider the special "Premium" features which help you get economical, dependable welding performance . . .

Easy Electrode Removal *is made possible—without lubrication—by the 8° taper of the electrode socket (4° per side) even at seating forces up to 6000 pounds.*

High Rate of Coolant Flow *is assured at the maximum rate by enlarged coolant passages. "O" ring seals prevent leaks. Stainless steel construction prevents rust.*

High Strength Ejector Mechanism *designed and built to operate at electrode forces up to 6000 pounds. Ejection is fast . . . easy.*



Close Barrel Diameter Tolerance *(1.497"-1.499"). Smooth, straight, ground barrel provides positive holder alignment . . . uniform, secure clamping . . . low contact resistance.*

Nickel Plated Barrel *protects against abrasion and corrosion with a pure, high quality nickel plating.*

Standard Mallory Fluted* Electrodes with 8° taper (4° per side) are available in a variety of sizes, shapes and alloys for use with "Premium" holders.

*Patent Pending

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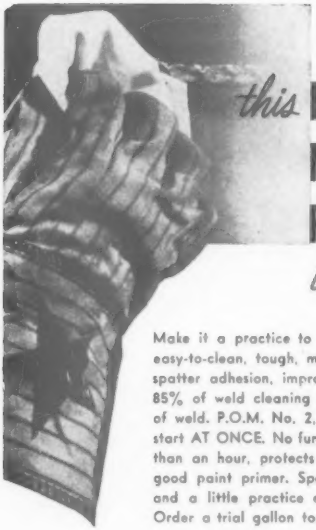
For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio



this PRACTICE MAKES for PERFECT welds

Make it a practice to use Protect-O-Metal before welding—and get easy-to-clean, tough, more perfect welds everytime! P.O.M. cuts out spatter adhesion, improves fluxing, stabilizes the welding arc, saves 85% of weld cleaning time and labor—all for about 1/10c per foot of weld. P.O.M. No. 2, water soluble, goes on fast and welding can start AT ONCE. No fumes, no trouble. P.O.M. No. 8 dries hard in less than an hour, protects from rust and corrosion for months, and is a good paint primer. Spatter wipes off either in a flash! With P.O.M. and a little practice even amateurs can make more perfect welds. Order a trial gallon today.

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A single pass of SEACO allows parts to workharden and therefore last longer. It takes the toughest impact and abrasion—much longer than many of the more expensive brands. SEACO gives you more for your money, too—only 5% coating and 95% metal. Use SEACO over MANGANAL 11% - 13½% Manganese Nickel Steel build-ups. SEACO makes MANGANAL last up to 50% longer! Try it on your next job!

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Literature on latest methods for speedy and economical repair of worn equipment.

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Courtesy Mine Safety Appliance Co.

Portable Air Movers Take Away Welding Fumes

To remove fumes and sparks from welding stations, Eddystone Division of Baldwin-Lima-Hamilton Corp. has installed more than 100 portable compressed-air type ventilating "Air-Movers" (above, lower right).

The horn-like devices are 3 ft long and weigh about 5 lb. They can be placed in any location the weldor desires and remove 4 to 6 cu ft of air per second when operating on 20 to 30 psi air.

Advantages noted by Baldwin are the small initial investment required and the fact that no time was required to install expensive duct work throughout the plant.

Besides being used for fume removal, the air-movers are equally as efficient for introducing fresh air into confined areas to cool the atmosphere or to establish safe working conditions.

Operation of the ventilators is based on the venturi effect produced when compressed air (or steam) is expanded at high velocity through an annular orifice and outlet horn.

The weldor in the picture above is working on the 80-ton side platen of a hydraulic forging press of 11,000 tons capacity.

* * *

Army Engineers Sponsor Arctic Problems Seminar

A TWO-DAY conference on metals and design for low-temperature service was attended by leading researchers recently at the Engineer Research and Development Laboratories, Fort Belvoir, Va. A comprehensive correlation was attempted of low-temperature data available that might aid Arctic military and construction efforts. Cooperating with the engineers were army ordnance, Naval Research Laboratory, Bureau of Standards, private industrial and research organizations and government agencies.

Ferrous base metals, including ship plate, were discussed on the first day by the following men: G. Manning, Battelle Memorial Institute, "History of Low Temperature Evaluation Tests". Dr. M. Gensamer, Columbia University, talked on fundamentals of fracture in metals. Metallurgical aspects of low-temperature behavior were discussed by F. W. Boulger of Battelle Memorial Institute. Subject of the paper given by Dr. J. C. Fisher of General Electric, Schenectady, N. Y. was low temperature properties of ferritic alloys. The relation of transition temperature to chemical composition was discussed by Dr. O. T. Marzke of the Naval Research Laboratory.

Sam Tour, of Sam Tour & Co., talked on low-temperature uses of steels with high hardness. N. Kahn, New York Naval Shipyard, presented a paper on the significance of the tear test in evaluation of ship plate. A performance evaluation of structural plate and weldments was given by W. E. Pellini of the Naval Research Laboratory. E. M. MacCutcheon of the Bureau of Ships brought out some facts concerning ship design and structural failure. The Charpy V-notch test was discussed by D. E. Driscoll of Watertown Arsenal. G. S. Mikhalapov, Metallurgical Research and Development Co., described direct explosion tests on plate.

Non-ferrous metals at low temperatures were the subject of the second day's talks. The speakers included D. C. Rollins, Union Carbide and Carbon Corp.; F. M. Howell, Aluminum Company of America; E. Shuette, Dow Chemical Co.; Dr. W. L. Finlay, Rem-Cru; J. Juppenlatz, Lebanon Steel Foundry; P. Payson, Crucible Steel Co.; G. W. Geil, National Bureau of Standards; H. Schwartzbort, Armour Research Foundation.

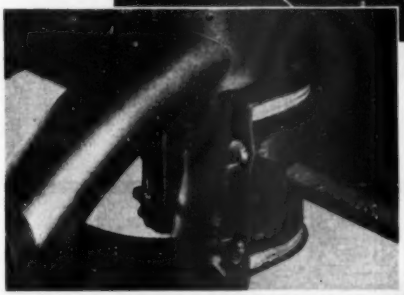
Discussions were held on the following topics: "Low-Temperature Welded Design of the Future", Dr. Finn Jonassen, NRC, Ships Structure Committee; "Low Temperature Metals of the Future" by N. E. Promisel, Bureau of Aeronautics; "Low Temperature Studies that should be Sponsored by Government or Private Industry", E. L. Hollady, office, Chief of Ordnance; and "Current Sources of Information on Low Temperature Properties", by J. Johnson, Wright Air Development Center.

Results of the conference will be published by the Office of Technical Information, Department of Commerce and furnished at cost. Those interested in receiving copies of the first edition should write to A. L. Tarr, metallurgist, Technical Service Dept., ERDL, Fort Belvoir, Va.

PERFECT WELDS

Rejects on the same job were formerly 20 to 25%

A large west coast manufacturer of welded steel pipe installed Vacu-Blast edge cleaning to eliminate seam leakage. Every length of pipe was pressure tested. Even with this stringent requirement, less than 1% of the welds were rejected after Vacu-Blast was installed.

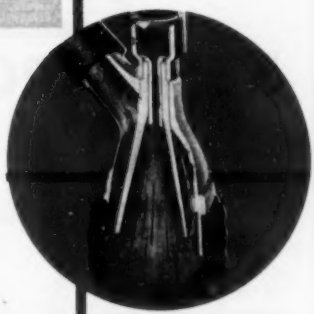


DUSTFREE CLEANLINESS PAYS OFF

Critical welds are perfect because Vacu-Blast gives unexcelled precleaning. Rust, scale and dirt are completely removed regardless of the original condition of the steel surface. In addition, Vacu-Blast's unique vacuum return carries off all the abrasive and dust.

VACU-BLAST ADAPTS TO EITHER MANUAL OR AUTOMATIC WELDING

Vacu-Blast can be used either manually or as a built-in installation on automatic welding. It is used successfully on edge thicknesses from 28 gauge sheet to 2-inch thick plate or shapes. Vacu-Blast double guns clean top, bottom and edge simultaneously.



HOW THE VACU-BLASTER WORKS

A stream of steel grit blast cleans the surface with great thoroughness. A vacuum return sends the abrasive, dust and dirt back to the blast generator. The gun's surrounding bristles keep dirt and abrasive from scattering about your plant. All abrasive is continuously reclaimed for reuse time and again.

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Weld with Wagner

ELECTRODE HOLDER

Gives long trouble-free service because it cools more readily, due to its patented channel construction. Designed for Welders by a Welder. This is one among many exclusive WAGNER features.

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GROUND CLAMP

Practical engineering producing a ground clamp best suited for every Welders need. Enclosed spring, rugged construction with spring adjustment. Use WAGNER clamps to complete your welding circuit.

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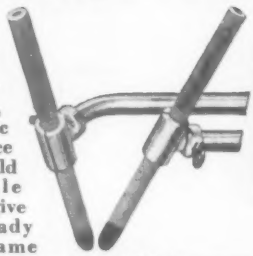
KEEN-ARC CARBONS



FOR CONSISTENTLY GOOD RESULTS

Designed to carry the high currents necessary for intense heat, BBB Keen-Arc Carbons produce a fine-grained weld of high tensile strength. They give a smooth, steady "flowing" flame which does not wander and which is concentrated at the desired focal point. Flame temperature is easily and accurately adjusted by merely changing the ampere input, and heavy copper coating permits gripping at extreme ends—eliminates frequent and periodic resetting.

A COMPLETE LINE OF CARBON WELDING SUPPLIES including carbon and graphite electrodes, carbon rods and plates, welding paste, etc.

Write for catalog.

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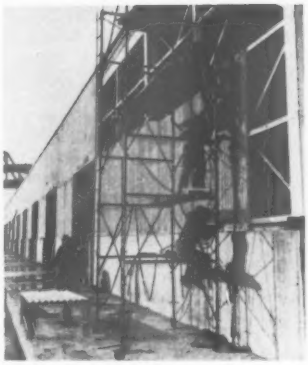


Salt Air Problem Solved by Stud Welding

CONTRACTORS responsible for erection of the Port of Boston Authority's new Mystic Pier No. 1 have made use of stud welding to overcome design and salt air problems. The 246,000 sq ft transit shed is surrounded on three sides by sea water.

Stainless steel studs end-welded with the Nelson stud-welding gun are used to anchor about 560 squares of corrugated asbestos siding, which encloses the building. Size of the studs is $\frac{1}{4}$-20 by $1\frac{1}{2}$-in.

Besides the stainless studs, solid zinc alloy collarnuts and cadmium plated studs were also used, the latter for installation of interior fire curtains. Use of the welded studs has enhanced the interior appearance and will simplify maintenance, according to George L. Wey, chief engineer of the Port Authority.

More than 32,000 lineal ft of sprinkler lines were installed in the shed above the bottom chord of the welded roof trusses. Since the trusses support a flat concrete roof deck, engineers saw there was no place to fasten clamps of the type commonly used to suspend sprinkler pipe.

H. G. Vogel Co., subcontractors for the sprinkler system, adopted stud welding in the interests of speed and economy. More than 4,000 $\frac{1}{2}$ by 2-in. female studs were welded on the underside of the flanges at the top of the trusses and $\frac{3}{8}$-in. rods of the proper length were used to extend the supports to the level at which the sprinkler lines have been suspended.

Merritt-Chapman and Scott Corp. was general contractor. Federal Sheet Metal & Roofing Co., Jamaica Plain, Mass., installed the siding.

* * *

Government, even in its best state, is but a necessary evil; in its worst state, an intolerable one.—Thomas Paine

Copper Welded to Steel Makes New Brake Drum

GREATER highway safety and a reduction in accidents due to brake failure are expected to result from a new brake drum of welded copper and steel. Under development for five years, it is made by Copperweld Steel Co., Glassport, Pa.

Tests show that the copper-steel drums have an average life of 278,000 miles, almost seven times the maximum of only 40,000 miles for ordinary drums. Brake linings on the new drums average 161,000 miles, topping 4 to 1, the up to 40,000 mile average on cast iron surfaces.

Function of the copper in the new drums is to carry off the high heats developed in auto and truck braking. Ordinarily, these high heats burn the surfaces of the linings and the drums, causing wear, cracking and "fading", a term for loss of braking power due to overheated drums.

Design of the new drums involves welding a copper base (having a series of copper fins) to the outer surface of alloy steel drums. During braking, the friction heat is drawn off through the brake surface, equalized over the copper base and then sent into the air through the fins.

* * *

New Welding Gas Plant for British Columbia

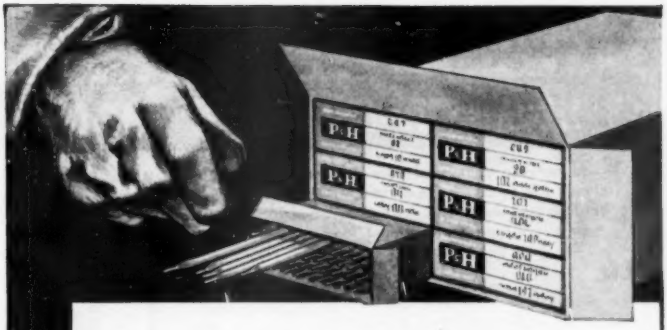
AN oxygen and acetylene plant planned by Canadian Liquid Air Co., Ltd. will be the first manufacturing plant to be established at Kitimat, B.C. Kitimat is a new production site of Aluminum Co. of Canada located in upcoast British Columbia.

Construction of the Canadian Liquid Air plant will precede even that of the aluminum project. Gas products of the new plant are needed in construction of the development and to supply other industries attracted by the cheap hydro-electric power with welding and associated services. Plans for establishing industries such as lumbering, pulp mills, mining and welding shops are being drawn up.

* * *

Big Furnace Treats 60-Ft Long Weldments

A NEW stress-relieving furnace at the Eddystone plant of Baldwin-Lima-Hamilton Corp. has a length of 60 ft 5 in., is 22 ft wide and 17 ft 1¾ in. high. It will be able to handle massive weldments for hydraulic presses, hydraulic presses and other equipment built by Baldwin. The furnace was built by the Industrial Power Equipment Co., industrial furnace division, and is the largest of its kind.



Now — in one handy package — *an assortment of electrodes to meet every emergency!*

NEW P&H

Maintenance Pack

At your fingertips — an assortment of five different kinds of rods for repair and maintenance welding. Packaged to stay dry — clearly identified to make selection easy.

With the P&H Maintenance Pack, you no longer have to buy seldom-used rods in quantities larger than you need. Instead, in one convenient package, you can keep some of each type on hand — economically!

And you're equipped to do all kinds of jobs — with fast, easy, sound welds. Just look at what the versatile P&H Maintenance Pack gives you:

1. **5 lbs. each AC-3,** 1/8", 5/32", 3/16" — For all position welding of mild steels and sheet metal. Can be used with AC or DC welders.
2. **5 lbs. AC-1,** 5/32" — For mild steels. The most universal electrode yet developed. Unusually easy to handle in any position, with good penetration. AC or DC.
3. **5 lbs. 70LA2,** 5/32" — For welding high-carbon, alloy, high-sulfur, free-machining, cold-rolled, and other hard-to-weld steels. Ideal for steel casting repairs. AC or DC.
4. **1 lb. Harstain,** 1/8" — For spring steels and stainless steels of all kinds. AC or DC.
5. **1 lb. Nicast,** 1/8" — For machinable welds on cast iron. Nicast welds are strong and non-porous.

$13.50 COMPLETE

Let the P&H Maintenance Pack save time, trouble, and money for you. Order from your P&H representative or local distributor. Mail coupon for name of one nearest you, and for further information.

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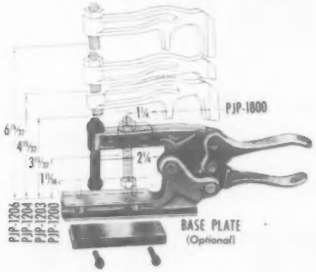
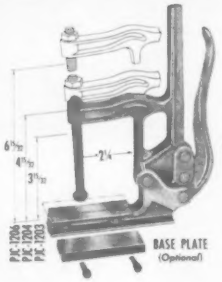
8 NEW *KNU-VISE* MODELS

—to increase your production clamping efficiency still further by extending your work-holding range. Also bringing to your tool room a new type of equipment, long needed.





Base plate furnished 2 ways: (1) Loose, soft, so you can adapt it to your needs; (2) Installed, hard; thickness, including parallel jaw, 1".

Send for new catalog showing full line of KNU-VISE Clamps

Sales Offices in principal cities. Teletype DE-49

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Welding Idea Earns Westinghouse Man $905

AN idea resulting in a 50% saving on sheet steel netted a Westinghouse employee a $905 check. He is John Shanoski, who has worked at the Westinghouse East Pittsburgh plant for 22 years. His idea saves steel in the construction of turbine-generators.

Under the old method of making turbine-generator bore rings, it was necessary to cut one-half of the ring from one steel sheet, while the other half of the ring was cut from a second sheet. The two segments were then welded together. At Mr. Shanoski's suggestion, quarter rings will be cut from one sheet of steel and then all four segments welded together. While the new operation involves twice as much welding, only one sheet of steel will be used. A similar idea is now applied also in the manufacture of waterwheel generator parts.

* * *

Lindberg Engineering Opens Plant No. 2

WITH the opening of its second plant, Lindberg Engineering Co., Chicago, has added 6,200 sq ft of production space. Located at 2317 Grand Avenue, Plant No. 2 will manufacture small induction heating outfits, Fisher-type melting furnaces, laboratory furnaces and atmosphere generators. The main plant at 2444 W. Hubbard will henceforth speed up its production of large industrial heat treating furnaces.

* * *

Speer Carbon Merges Its Subsidiaries

SPEER Carbon Co. and its subsidiaries, Jeffers Electronics, Inc., DuBois, Pa.; International Graphite & Electrode Corp., Niagara Falls, N.Y.; and Speer Resistor Corp., St. Marys, Pa.; have consolidated into one company. It will be known as the Speer Carbon Co., with headquarters at St. Marys, Pa. The former subsidiaries will operate as divisions of Speer.

* * *

German Welding Show

A WELDING and flame-cutting exhibition and trade fair was held at Essen, Germany, June 19 to 29. About 100 firms displayed their most recent equipment and techniques. Specialists in welding from other European countries were also in attendance.

—*McGraw-Hill World News*

IF IT'S A BIG JOB...

YOU'RE SURE TO NEED

Rexarc HARD-FACING AND MANGANESE ELECTRODES

If you're getting set for a big rebuilding job, count on Rexarc Hard-facing and Manganese Electrodes to save you time and money!

You'll like the fast build-up, the smooth running and long wearing qualities of these carefully engineered electrodes. And, you'll like the savings, too. Because of Rexarc's metallic coating, you get a maximum of deposit per pound of rod. This means Rexarc Electrodes are the least expensive on the market, regardless of price per pound.

No wonder Rexarc is first choice among thousands of weldors from coast to coast! We suggest that you get acquainted with Rexarc, today! Call your Welding Supplies Distributor at once, or write

THE SIGHT FEED GENERATOR COMPANY

West Alexandria, Ohio, U.S.A.

Manufacturers of Welding Equipment For More Than 25 Years

About People

KEITH P. RINDFLEISCH has been appointed sales vice-president of United States Steel Supply Division of U.S. Steel. He joined the supply division as a salesman in Chicago in 1937.

* * *

WOODROW BOEDECKER has rejoined The Bastian-Blessing Co., Chicago, as a research and development engineer. He has recently served as production and design manager for K-G Welding and Cutting Co. Mr. Boedecker has specialized in the design of welding and cutting equipment for the past fifteen years.

* * *

J. C. FINK was appointed engineering manager of industrial products for Westinghouse Electric Corp. He will coordinate engineering activities of all the industrial products divisions. Mr. Fink was formerly assistant to the vice-president in charge of engineering.

* * *

E. M. KLINE was named general manager of the Huntington, W. Va. works of The International Nickel Co., Inc. He succeeds HERMAN M. BROWN, who is retiring, but will continue to serve the company on a consulting basis. G. K. CROSBY will succeed Mr. Kline as assistant general manager. Mr. Kline joined International Nickel in 1923 and has been assistant general manager at Huntington since 1947.

* * *

DR. DAVID ROZET has joined the Weldwire Co., Philadelphia, Pa., as vice-president and director of research. Previously he was employed for more than nine years by the Arcos Corp., Philadelphia. Dr. Rozet has been active in various phases of research on coatings for arc welding electrodes and on welding in metallurgy.

* * *

ROBERT C. CARRUTHERS was appointed assistant sales manager of welding products for American Manganese Steel Div., American Brake Shoe Co., Chicago Heights, Ill. He is a graduate of Massachusetts Institute of Technology and started with American Brake Shoe in 1950 as a metallurgical assistant. Prior to his new appointment as assistant sales manager, he was a sales development engineer.

METALITE

HARD FACING RODS of PREMIUM QUALITY

For a Wide Range of Applications . . .

With the development of METALITE, the Adams organization gives to the Welding Industry a complete line of finest quality hard facing alloy rods to cover a variety of applications.

- **METALITE**
- **METALITE No. 6**
- **METALITE No. 1**
- **METALITE A**
- **METALITE B**
- **METALITE C**

Because wear factors are different on similar types of equipment under various working conditions, no One hard-facing alloy is suitable for all wear problems. It is sometimes difficult to make the proper selection of a hard-facing material. If you have a wear problem why not take advantage of our 25 years of intensive research and the services of our engineering department.

Metalite "A" (nickel Manganese) is used to rebuild worn sprockets. The cost, after hard-facing, is much less than the cost of a new sprocket, and the service expectancy much longer. Other typical rebuilding applications are tractor rails, crusher rolls, jaws, and Gyratory Mantels, clutch parts, shaft, gears and sprockets.

SEND FOR BULLETIN **which gives many helpful suggestions and shows a list of tested applications.**

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✓ *Maximum Productivity* ✓ *Complete Safety*

✓ *100% Speed-Tested Durability* ✓ *Lower Operating Costs*

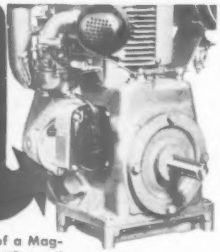
EVERY SINGLE ATLANTIC WHEEL MADE— from the 2 inch size right on up — is test run at a 50% higher speed than that required for normal snagging operations. This assures smooth, dependable cutting action plus an extra measure of on-the-job safety. Then, too, because all Atlantic Wheels are made with a special, extremely rugged Resinoid Bond, they naturally wear longer . . . permit continuous, high-speed grinding . . . and never have to be dressed to restore cutting surfaces.

CHECK THESE and other time and labor-saving Atlantic advantages for yourself. Send for the new, fact-packed Atlantic Grinding Wheel Catalog today . . . you'll find it's filled with complete information on hundreds of different type wheels for every job in the shop. Atlantic Abrasive Corp., 545 Pearl St., So. Braintree, Mass.

ATLANTIC ABRASIVE CORP.

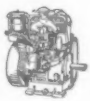
South Braintree 85, Massachusetts

Why WISCONSIN HEAVY-DUTY *Air-Cooled* ENGINES Have a Rotary-Type OUTSIDE MAGNETO



Perhaps you have never given much thought to the placing of a Magneto on an engine, nor whether it's of the "flywheel" or "Rotary" type. It's an important point because the magneto is really the heart of the engine. When it fails, your power fails.

Wisconsin engineers have found through long experience and experimentation that the best place to put the magneto, not only for convenient accessibility but for better ignition performance over an extended period of time is on the OUTSIDE . . . with an independent, direct drive from the engine to the Magneto. The Rotary Type high tension magnetos used by Wisconsin Air-Cooled Engines provide the greatest protection against ignition troubles because the Magneto itself is a complete, independent operating unit that doesn't rely on an unrelated part of the engine for its successful operation. It's tightly sealed against dust and moisture, of course, so it isn't affected by wet weather or snow and there is no chance of it getting "fouled up". And it's equipped with an *Impulse Coupling* that provides a quick, hot spark for easy starting in any weather, in any climate, a feature that can't be incorporated in flywheel-type magneto.



Yes, the MAGNETO is important . . . both as to *type* and *placing* on the engine. It's the *right kind* and in the *right place* on Wisconsin Heavy-Duty Air-Cooled Engines. Specify "Wisconsin" for your 3 to 30 hp. power needs. . . . Descriptive literature on request.

WISCONSIN MOTOR CORPORATION

World's Largest Builders of Heavy-Duty, Air-Cooled Engines

MILWAUKEE 46 WISCONSIN

HARRY W. KRANZ, with the Cleveland Welding Co. for 41 years and president since 1926, is retiring. Mr. Kranz joined the company in 1911 as chief engineer and served successively in various capacities. For many years he has been a director and officer of the Tire & Rim Association, Inc., and also of the Bicycle Institute of America. He will be succeeded by WILLIAM A. SIPPRELL, JR., chairman and president of H. & B. American Machine Co., Rhode Island.

* * *

THOMAS A. STRATFORD was appointed to the newly created post of assistant manager of product development and advertising for The American Welding & Mfg. Co., Warren, O. Stratford came to American Welding after seven years with the lamp division of General Electric Co., Cleveland, where he served as assistant manager of media advertising and most recently as community relations representative.

* * *

RUSSELL FERENCZI was named regional manager for All-State Welding Alloys Co., Inc. He will take care of sales and services of All-State alloys and fluxes in New England and eastern New York. Previous to joining All-State, Mr. Ferenczi was a salesman for C. W. Krieg Co.

* * *

JOHN W. LOHNES was appointed vice-president of sales for the Jeffers Electronics and Speer Resistor divisions of Speer Carbon Co. Whereas Mr. Lohnes was previously vice-president of sales for the Speer Carbon Co. and its International Graphite and Electrode division, he now holds that office for the entire company.

* * *

METAL & THERMIT CORP., New York, has appointed four new men to field sales for its electric welding division. ROBERT FRENCH and BYRON STROUGH will operate from the Newark, N. J. office. Mr. French, formerly welding engineer for Daystrom Co. will cover New England. Strough will be representative in up-state New York. HUGH WARD, operating from the Philadelphia office, will cover the Eastern Pennsylvania area. He has been with the Autocar Co. R. L. HOWLAND comes to Metal & Thermit's Chicago sales office from Pullman Standard Car Co. where he was a welding technician.

* * *

ARTHUR H. NELSON has been appointed Chicago branch manager of electric tool sales for Independent Pneumatic Tool Co., Aurora, Ill.

OFTEN NOT KNOWN...
OR WELL CONSIDERED!

GOOD SOUND
BRAZED JOINTS
CAN'T BE MADE
WITH A POOR
BRAZING FLUX

IF your brazed joints have low strength, or leak . . .

IF you get joint voids, inclusions, and generally poor brazing results

DON'T blame the brazing alloy, the operator, or the brazing process until you have checked the capacity of the flux you are using . . . for more brazing failures are caused by the use of an unsuitable flux than by brazing alloy variables.

TRY THESE NEW EXTRA CAPACITY FLUXES made to new chemical formula.

RED LABEL FOR FAST HEATING

BLUE LABEL FOR TORCH HEATING

7 PERFORMANCE IMPROVEMENTS MEAN BETTER BRAZING AND LOWER COSTS

MADE BY THE PRODUCER OF United WIRE BRAZING ALLOYS

For complete information ask your
WELDING SUPPLY DISTRIBUTOR
or our nearest office

This new free 12 page illustrated bulletin RESEARCH STUDIES OF BRAZING FLUXES will give you a better understanding of flux functions and flux efficiencies and will mean better brazing at lower costs. Ask for Bulletin F-37.

UNITED WIRE
& SUPPLY CORPORATION
PROVIDENCE, RHODE ISLAND
SALES OFFICES
New York Chicago Springfield, Mass. Philadelphia
Rochester Pittsburgh Lansing, Mich. Los Angeles
Minneapolis Akron Hartford, Conn.

WALTER B. MEYER is president of the newly established St. Louis Metallizing Co., St. Louis. Vice presidents are JOSEPH A. PERESSIN and RAYMOND CRAVEN. ELMER STITT is secretary - treasurer. The company was formerly the metallizing division of Nooter Corp. Mr. Meyer is well-known in the metallizing industry, having served during World War II in the China-Burma-India theater and since in many significant metallizing contracting and construction tasks.

* * *

HAL P. KIBBEY has been appointed Chicago district manager of United States Steel Supply Div. to succeed KEITH P. RINDFLEISCH, who was promoted to sales vice-president of the division. Mr. Kibbey was formerly the assistant district manager at Chicago.

* * *

AL DRAKE has joined the Dayton branch of The Burdett Oxygen Company of Cleveland. Mr. Drake, a graduate of the University of Washington in mechanical engineering, welding and metallurgy, has been associated with Linde Air Products Co., as salesman, sales engineer and process service engineer. He was also with the Whitmore Oxygen Co., Salt Lake City. He has served as secretary of the Independent Oxygen Manufacturers Association and vice-chairman of the Salt Lake section of the American Welding Society.

* * *

W. S. SCHAMEL has been advanced to assistant technical director of the dust and fume control division of American Wheelabrator & Equipment Corp. He was formerly sales engineer.

* * *

WILL CAIN has been appointed New Orleans sales representative for the A. O. Smith Corp., steel fabricators and process equipment manufacturers. Mr. Cain, a 1948 graduate of the University of Texas, previously was a sales engineer on A. O. Smith's Houston staff.

* * *

DAVE HECKINGER has re-joined the sales engineering staff of Fansteel Metallurgical Corp. He will work out of the main office at North Chicago, Ill., engaged in sales and service of products manufactured by Weige: Weed & Co., a Fansteel subsidiary.

If you do AC Bronze Welding, check these Advantages

- No snuff outs
- Easy striking
- Wear resistant
- Corrosion resistant
- Welds dissimilar metals
- High strength
- High ductility
- Can be used with AC or DC

You get them all with AMPCO-TRODE* 'AC' Coated Aluminum Bronze Electrodes

THESE Ampco-Trode "AC" advantages mean lower welding costs for you—better, faster jobs—less trouble. Besides the advantages listed you also get a smooth bead that feather-edges perfectly into the base metal — whether it's used on cast iron, malleable iron, bronzes, some nickel alloys, or dissimilar metals.

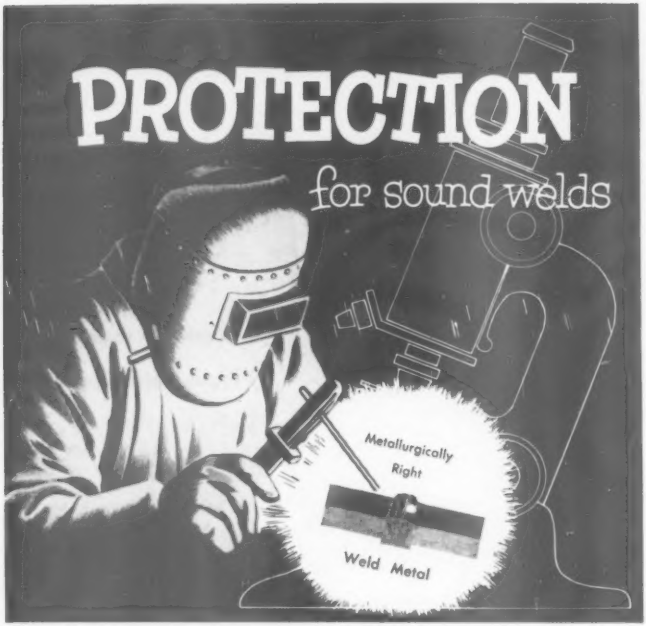
Moreover, Ampco-Trode "AC" beads are free from porosity and surface pitting. Spatter loss is low, too.

Ampco-Trode "AC" is available in 5 grades having Brinell hardness ranging from 135 to 300, tensiles from 77,000 to 90,000 psi, and yield strengths from 35,000 to 69,000 psi.

For additional information about versatile, money-saving Ampco-Trode "AC" electrodes call your nearby Ampco distributor or write us.

*Reg. U. S. Pat. Off.

AMPCO METAL, INC.
MILWAUKEE 46, WISCONSIN
West Coast Plant: Burbank, California
It's Production-Wise to Ampco-ize!



Use ARCOS "Quality Controlled" Stainless Electrodes

In the split-second flash of an arc, Arcos stainless electrodes produce the "right" weld metal for the job at hand. This is the result of Arcos' experience with fabricators' welding problems . . . competent research in the behavior of various grades of electrodes in use and weld metal in service . . . a strict application of quality control in manufacture.

The value of any electrode lies in the quality of the weld metal it produces. And that's where Arcos strives to build the values that count . . . soundness, specific mechanical or corrosion resistant properties, or microstructures that can stand-up to destructive service conditions. ARCOS CORPORATION, 1500 South 50th St., Philadelphia 43, Penna.

WELD WITH ARCOS

Specialists in Stainless, Low Hydrogen and Non-Ferrous Electrodes

HERBERT G. AUSTIN, retired manager of the Boston sales office of Lukens Steel Co., has been awarded a scroll by the Boston chapter of the American Welding Society. The scroll is in recognition of the leadership and active part Mr. Austin took during the formative years of the chapter. He has been associated with the steel industry for fifty years, which concluded with his long service as district manager for Lukens at Boston.

* * *

JAMES R. WEAVER has been appointed assistant to T. I. Phillips, vice-president in charge of manufacturing for Westinghouse Electric Corp., Pittsburgh, Pa. For the past four years, Mr. Weaver has been on assignment to Baldwin-Lima-Hamilton Corp. where he served as vice-president in charge of manufacturing.

* * *

WILLIAM L. WEARLY was elected general sales vice-president for Joy Mfg. Co., Pittsburgh, Pa.

* * *

M. E. ZIEGENHAGEN was named advertising and sales promotion manager of Worthington Corp., Harrison, N.J. Ziegenhagen has been associated with General Electric Corp. since his graduation from the University of North Dakota in 1937 where he was awarded a B.S. degree in mechanical engineering.

* * *

Five district managers for the United States and one for Canada have been appointed by GLEN H. TRESLAR, vice-president in charge of sales for The Black & Decker Mfg. Co., Towson, Md. These new appointees will report to the general sales manager at the Towson headquarters. The men so named are E. M. STUART, northeastern region; A. LEE PROCTOR, southeastern; RAYMOND G. HORNER, central; WILLIAM L. POYNTER, midwest; ARTHUR S. BOEHM, Pacific coast, and DONALD S. MCKERACHER for Canada.

* * *

NORMAN C. PENFOLD has been appointed associate director of Southwest Research Institute, San Antonio, Tex.

* * *

DR. WILLIAM D. COOLIDGE, former vice-president and director of research for General Electric Co., will be the first recipient of the K. C. Li Prize and Award for his pioneer work on tungsten. The award consists of a gold medal and an honorarium of $1,000, to be awarded every two years. It was established by Mr. K. C. Li, the discoverer of tungsten, and chairman of the board of the Wah Chang Corp., New York City.

30 YEARS AGO

(From THE WELDING ENGINEER of Aug., 1922)

SCRAPPING by flame-cutting of the famous battle cruiser *Brooklyn*, fighting flagship under Admiral Schley in the Spanish-American War, is now going on. The ship cost more than $5,000,000 to build and drew only $40,000 from a scrap dealer at the recent bidding. The ship will yield 6,500 tons of steel.

—30 YEARS AGO—

"A SEWING machine for steel" is the motto for a new Lincoln Electric Co. automatic arc welding machine. With this new device the pieces to be welded are held in a clamp or special fixture directly beneath the arc. The arc is moved forward over the seam automatically, and the carbon electrode is also fed down automatically.

—30 YEARS AGO—

HOT residents of Rochester, N. Y., are getting their ice cream delivered these days in welded ice cream trucks and wagons. All the trucks of the Rochester Ice Cream Co. have been remodeled to accommodate a welded cold storage chamber made from 10 gage sheet iron. Formerly the deliverymen had a hard time wrestling the ice cream cans out separately from a mass of ice and salt in the truck bed.

—30 YEARS AGO—

ONE of the most successful and pleasant mid-summer conventions in the history of the Gas Products Association was held at Mackinac Island, Michigan, July 18 to 22. Members were told of the advantages offered by membership in the American Welding Society.

—30 YEARS AGO—

PLANS are being made for the annual meeting of the American Welding Society in Chicago this coming October.

—30 YEARS AGO—

WELDING men in the city of Melbourne, Australia, have organized the Victorian Oxy-Acetylene Welding Association. It has allied itself with the Victorian Automobile Chamber of Commerce.

—30 YEARS AGO—

THE MODERN Engineering Co., St. Louis, Mo., has recently moved to a new factory building at 3411 Pine Blvd. In addition to a complete line of oxyacetylene welding and cutting equipment, Modern is marketing a very attractive looking "cowl ventilator" for automobiles.

Use ARCOS Low Hydrogen Electrodes

ARCOS GRADE	A.W.S. SPEC.
Tensilend 70	E7016
Tensilend 100	E10016
Tensilend 120	E12015
Manganend 1M	E9016
Manganend 2M	E10016
Nickend 2	E8015
Chromend 1M	E8015
Chromend 2M	E9015

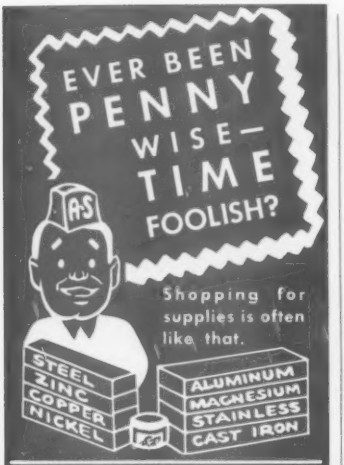
When you can deposit sound weld metal without changing electrodes to meet different welding positions—and use the same electrode on A-C or D-C current—you're saving time and inconvenience. With few exceptions, all types of Arcos Low Hydrogen Electrodes offer this advantage on a variety of base metals. That means a smaller inventory, since you can safely weld many jobs from start to finish with ONE ELECTRODE. Because Arcos Low Hydrogen Electrodes are "quality controlled," there's no danger of underbead cracking.

ARCOS CORPORATION • 1500 South 50th St., Philadelphia 43, Penna.

WELD WITH

ARCOS

Specialists in Stainless, Low Hydrogen and Non-Ferrous Electrodes



Now is the time to investigate two important services your nearby All-State Distributor offers. It makes sense to make him and All-State your one proven source for all alloys and fluxes needed for welding, brazing, soldering, tinning and cutting.

LOWER JOB COSTS—A-S Distributors stock a large variety of things you have to have quickly when you want them. They're competitive on price — usually lower if your eye is on the job costs. That comes of their handling All-State Alloys and Fluxes for all metals. They do jobs for less.

TECHNICAL SERVICE—Each All-State Distributor has men especially qualified by training and experience to aid in the proper selection and use of alloys and fluxes for jobs where you might need help. Back of them, and always ready to pitch in on the problem jobs are the All-State regional men and the well-known All-State technical service facilities at White Plains, N. Y.

All-State

for WELDING BRAZING SOLDERING TINNING CUTTING

FREE Ask for 32-page Buyers Guide to the complete line.

A-S DISTRIBUTORS *EVERYWHERE*

ALL-STATE

WELDING ALLOYS CO., INC.
White Plains, N. Y.

BOOK REVIEWS

Metallic Manganese

ELECTROLYTIC MANGANESE AND ITS ALLOYS. By Reginald S. Dean. Published by Ronald Press, New York, 1952. Cloth, 6 by 9 in. Price $12.

A record of the progress since 1936 in producing electrolytic manganese and developing its uses is contained in this book. An authoritative reference manual, it gives material from government publications and adds a very substantial amount of heretofore unpublished data from the author's own laboratory work. A rigorous attempt has been made to list all references on other work in the manganese field.

This book is probably one of the most significant and timely additions to modern metallurgical literature. This is particularly true in view of the great contribution electrolytic manganese can make to our domestic mineral economies. The book should prove useful to mining, metallurgical and chemical engineers, to manufacturers and fabricators, users of light metal alloys and electroplaters.

* * *

Welding Marine Piping

RULES FOR WELDING PIPING IN MARINE CONSTRUCTION—FERRITIC ALLOY STEELS. (Tentative). Published by American Welding Society, New York, 1952. Paper, 6 by 9 in., 12 pages. Price 50c.

These newest rules on marine pipe welding by the Welding Society complement earlier versions published for carbon steel pipes. Growing use of alloy steel in pressure piping systems on both land and sea makes it handy to have this guide on joint design, electrodes, welding procedures, post-heat-preheat, stress relief and the testing of welded ferritic alloy welds.

This booklet fills the bill in all respects, including a radiographic standard for evaluating weld quality.

* * *

Field Welding Tanks

STANDARD RULES FOR FIELD WELDING OF STEEL STORAGE TANKS. Published by the American Welding Society, New York, 1952. Paper, 6 by 9 in., 23 pages. Price 50c.

This revision of the 1947 edition on field welding of storage tanks includes for the first time provisions on automatic welding for tanks where liquid will be stored at less than 15 psi gage pressure. Presented also are qualifications for welding procedures and operators for automatic welding and for the use of low-hydrogen electrodes in manual arc welding. Where necessary, manual arc welding requirements have been brought up to date.

Perfect Soldering in half the time!

Use the ANZICK SLIP-ON SOLDERING TIP

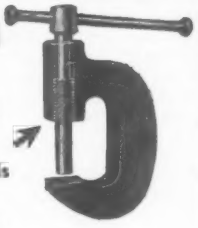
★ ELIMINATES TANK OXYGEN
★ ELIMINATES BUCKLING—WARPING
★ USES HALF THE ACETYLENE
★ FITS ANY WELDING TORCH

A proven soldering aid that eliminates all guesswork. Cuts acetylene cost in half. Uses air instead of tank oxygen—saves solder. Comes in 2 sizes—flame 1" wide and 2" wide—will fit any welding torch.

Write for free literature

ANZICK MFG. CO.
23675 MOUND RD., VAN DYKE, MICH.

"Red Head" WELDING CLAMPS



• Designed for Welding •

No Threads To Damage

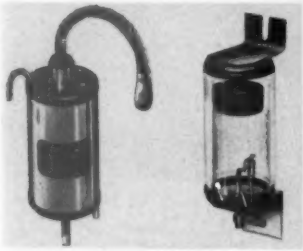
1. Case Hardened threads are always protected from weld spatter and never exposed to damage in open or closed position.

2. The clamp body is cut from solid plate, thereby insuring extreme rigidity and giving great resistance to bending or twisting.

3. Heat treated chrome molybdenum alloy handle offers great resistance to bending.

23 stock sizes

CHICAGO BOILER COMPANY
1969 CLYBOURN AVENUE
CHICAGO 14, ILLINOIS



New Ignitron Tubes

262 Two new ignitron tubes for controlling resistance welders have recently been attracting attention. They are the NL-1001, an air-cooled type for small resistance welders and the NL-5552, a metal, water-cooled tube for larger welders.

The first tube, the NL-1001, (at right) is capable of controlling 600 amp rms demand or 9 amp d-c at 250 volts a-c. It is said to be low in cost and to utilize an unusually economical mounting arrangement. Because its glass sidewalls permit observation of working parts, it is useful for demonstration and test work. It is designed for forced or free air cooling.

The water-cooled tube, NL-5552, has rating approximately equal to a 600-amp magnetic contactor. It has an all-copper cooling system that provides exceptional cooling efficiency, permitting a 30% saving in water. The mercury-pool cathode permits the tube to handle extremely high currents on an intermittent basis.

NATIONAL ELECTRONICS, INC., Geneva, Ill.

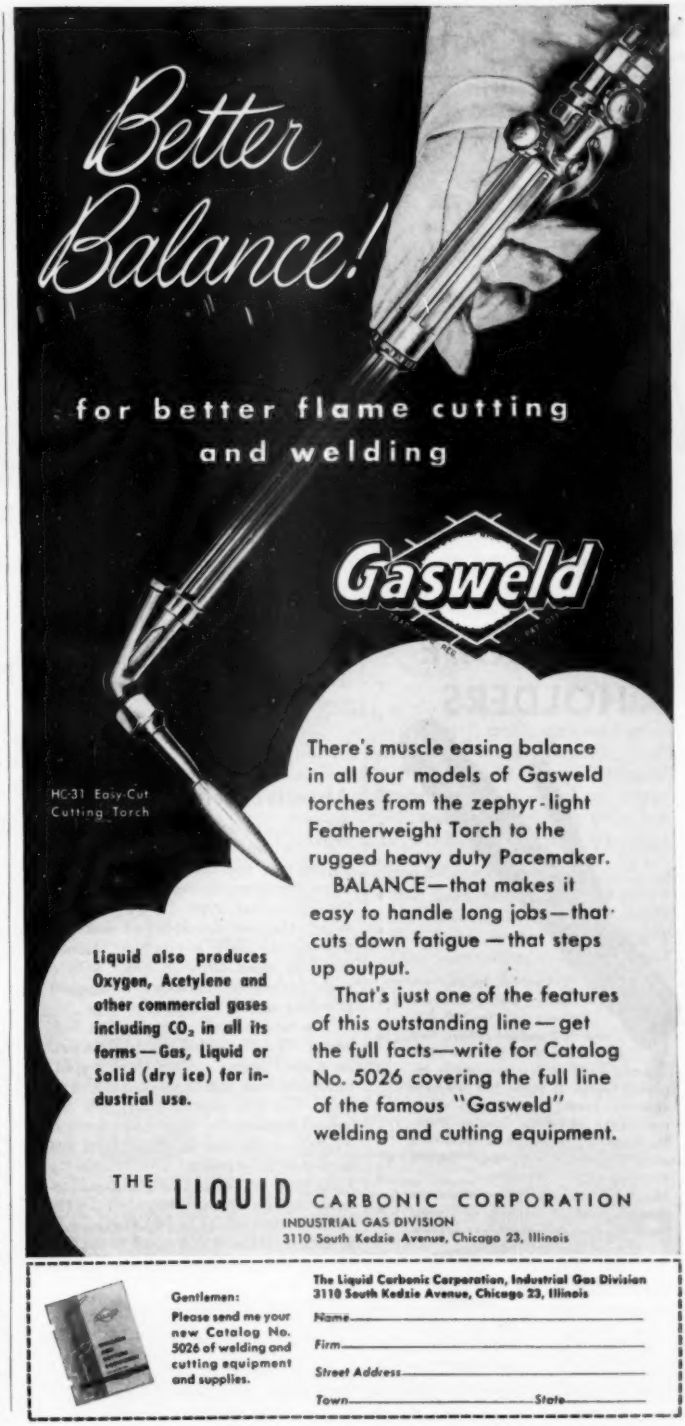
* * *

New Filling Solder

263 A NEW auto body solder called "Fil-Soder" utilizes aluminum to produce several heating and finishing advantages. According to word from Aluminum Company of America, the new solder takes 50% less heat than tin alloy solder and fills without fluxing or shrinking. No special tools or skills are required in its handling and it will stand a 350 F infra-red bake, says the manufacturer. Because of the aluminum, 4 oz will fill as much space as a pound of other solders.

It is said to have possibilities as a suitable material for repairing ferrous and non-ferrous castings. "Fil-Soder" comes in 3/8-in. round bars 12-in. long.

SWISS LABORATORY, Cleveland 14.


Better Balance!
for better flame cutting and welding
Gasweld
HC-31 Easy-Cut Cutting Torch
There's muscle easing balance in all four models of Gasweld torches from the zephyr-light Featherweight Torch to the rugged heavy duty Pacemaker.
BALANCE—that makes it easy to handle long jobs—that cuts down fatigue—that steps up output.
That's just one of the features of this outstanding line—get the full facts—write for Catalog No. 5026 covering the full line of the famous "Gasweld" welding and cutting equipment.
Liquid also produces Oxygen, Acetylene and other commercial gases including CO_2 in all its forms—Gas, Liquid or Solid (dry ice) for industrial use.
THE LIQUID CARBONIC CORPORATION
INDUSTRIAL GAS DIVISION
3110 South Kedzie Avenue, Chicago 23, Illinois
Gentlemen:
Please send me your new Catalog No. 5026 of welding and cutting equipment and supplies.
The Liquid Carbonic Corporation, Industrial Gas Division
3110 South Kedzie Avenue, Chicago 23, Illinois
Name
Firm
Street Address
Town
State

SPATTER CHATTER

Here's a COOL baby

not half so cool as

cam-lok

ELECTRODE HOLDERS

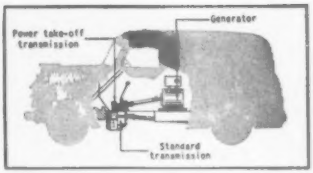
Cam-Lok Holders are really cool performers! Properly sized for 500, 300 and 200 ampere ratings, they have many other features which make them the first new, really improved holders in years: fast one-hand operation, newest type insulation, simple and rugged mechanism. Cam-Lok Welding Electrode Holders cost no more, save on maintenance, give far longer life and more inches-per-hour welding.

Also hailed by welders and engineers: Cam-Lok Cable Connectors, solid brass low resistance couplings without adapters.

New FREE Catalog
WRITE TODAY

cam-lok

DIVISION OF EMPIRE PRODUCTS, INC.
P. O. Box 98-F Cincinnati 36, Ohio



Power Drive for Welders

264 A SPECIALLY designed Pierce governor is an added feature of the Tangen power take-off unit which mounts directly on top of the regular transmission in a truck. This special drive can be used to drive welders or auxiliary lighting generators.

No V-belts or pulleys are required to mount the take-off apparatus, which is capable of delivering 97% of the power that is transmitted direct from the main gear drive. Speed of the power-drive shaft is in direct relation to crankshaft speed regardless of the gear ratio being used in the transmission.

The governor, when required, becomes a part of the drive shaft, thus providing instant governor action; it does not affect the speed of the engine when the power drive is in operation. When the drive is in neutral the vehicle is free to travel at any speed.

MOBILE POWER, INC., Detroit 2.

• • •

Abrasive Belt Wheel

265 A NEWLY designed contact wheel for abrasive-belt machines uses spare rubber tires to cut down replacement costs 50%. Called the Universal type "T-54" contact wheel, the new development makes it possible to have a complete assortment of spare tires on hand with a wide variety of surfaces for different grinding tasks.

The new wheel consists of a balanced "T-54" rubber tire vulcanized on a steel frame, or rim, and a split, universal hub machined from aluminum. The two sides of the hub are joined together by four Allen screws, which lock the tire in place. Tires are available in standard face widths of 1-in. to 6-in., with fractional widths made up on special order. A Durometer range of 10 to 90 is available in either plain surfaces or a variety of slot designs for particular grinding jobs.

CHICAGO RUBBER CO., INC., Chicago 14.

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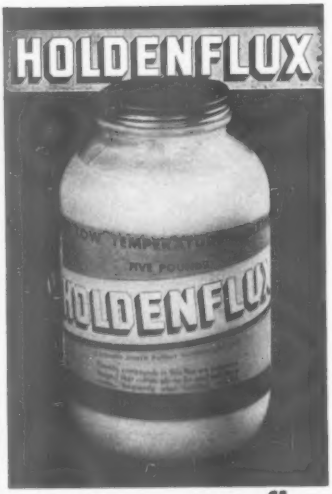
To obtain additional information on listed new products, use the cards on pages 17-18.



new type paste flux

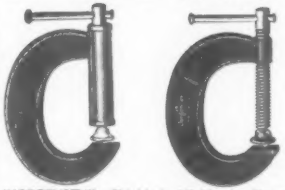
FOR SILVER BRAZING
COPPER, BRASS, BRONZE, STAINLESS, AND OTHER FERROUS AND NON-FERROUS METALS
Always Uniform. Never Cakes. No Mixing.

Estox Dry Flux F13
FOR BRAZING CAST IRON, STAINLESS, COPPER, STEEL, SPECIAL APPLICATIONS
Two Shipping Points: New Haven and Detroit

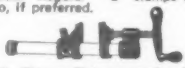
The STANDARD SUPPLY COMPANY
460 WE Grand Ave., New Haven, Conn.

"Jorgensen" and "Pony"
TRADE MARKS REG. U.S. PAT. OFF.

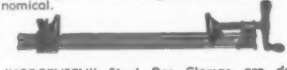
CLAMPS for WELDERS:



"JORGENSEN" Shielded Welders' Clamps eliminate damage from "spatter", and are low-priced. "Regular" "C" clamps are available too, if preferred.



"PONY" Clamp Fixtures make ideal bar clamps on any length of black pipe. Fast operating—sure holding—and most economical.



"JORGENSEN" Steel Bar Clamps are designed for the severe requirements of welding service; exclusive "multiple disc clutch" makes for instant adjustment—economy. The trade-mark "JORGENSEN" or "PONY" on your clamps is assurance of utmost satisfaction in service—specify and insist upon them from your supplier. FREE CATALOG ON REQUEST.

ADJUSTABLE CLAMP COMPANY
"The Clamp Folks"
426 N. Ashland Ave., Chicago 22, Ill.

Spark Lighter-Cleaner

266 A NEW control accessory answers to the critical welding flint spark lighter and tip cleaning tool. The 12 tip cleaners have spiral design ribs that not only strengthen the shaft but step up the efficiency of cleaning. The cleaners, incidentally, are guaranteed against breakage and will be replaced free of charge. Called "Tip-O-Liters," they are available through jobbers or from the company.

THERMACOTE Co., Newark, N. J.

* * *

R-W Slope Control

267 A NEW control accessory answers to the critical welding applications involving aluminum, magnesium and other such metals. It is a synchronous precision control with positive and negative slope control and is capable of qualifying single-phase machines.

The slope control is available as an accessory, as shown in above picture or as a built-in feature. Plug-in connectors permit easy replacement. NEMA 7B and 9B sequence timers are interchangeable.

Advantages of slope control are said to be reduced tip pick-up, longer life for electrodes and considerable reduction of expulsion and spatter. Overall cabinet dimensions are 62-in. high, 24-in. wide and 15-in. deep.

WELTRONIC Co., Detroit 19.

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GB No. 45	Silver Solder, melting range	1125-1145°F
GB No. 41	Silver Solder, melting range	1125-1160°F
GB No. 35	Silver Solder, melting range	1130-1270°F
GB No. 31	Silver Solder, melting range	1130-1300°F

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The physical properties and appearance of a brazed joint are controlled to a large degree by the flux which is used. For this reason it will pay you to team-up GB Flux with GB Silver Solder — they were developed to produce maximum results when used together.

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Clean Discolored Welds

268 A SIMPLE apparatus for removing heat discoloration from welds and weld areas in stainless has been developed by Armco. It can reach inside corners of sheet metal work, too.

All that's needed are a short length of copper rod, some rubber tubing, electrical cord, clamps, a small step-down transformer and a solution of 50% phosphoric acid. The present apparatus is said to be simpler than the original one, which used d-c.

Discolored weld seams can be treated at rates of two to four ft a minute with the proper set-up. Weld areas are left clean and bright as well as free of scale. Though a patent has been applied for by Armco, permission for use of the process will be granted at no charge, whether or not a patent is issued.

DEVELOPMENT ENGINEERING DEPT., ARMCO STEEL CORP., Middletown, Ohio.

* * *

Tool Tip Brazing Shims

269 FOR efficient joining of carbide tool tips to tool bases, new brazing shims have been developed. They consist of three layers—a copper center sandwiched between two claddings of silver. The 0.011-in. thick shim has a 0.005 layer of copper, clad with 0.003 "Silvaloy" No. 503. The 0.016 shim has an 0.008 in. copper center clad with 0.008 of Silvaloy No. 503. The 0.020 shim has a 0.010 copper center clad with 0.005 layer of Silvaloy No. 2501. It comes in all standard tool sizes.

STEEL SALES CORP., Chicago 23.

* * *

To obtain additional information on listed new products, use the cards on pages 17-18.

Metal Sprayed Molds

270 MOLDS for plastics manufacturers can now be made in minutes with a new metallizing-gun application. The master mold is sprayed with a layer of low-melting-point alloy to a thickness of 0.040 in. Ten a layer of aluminum bronze alloy some 0.030 in. thick is sprayed on for additional strength and to remove internal stresses. Another 0.040 in. layer of low-melting-point alloy is put on top of the aluminum bronze coat and the plastic mold is finished.

Advantages claimed besides very high speed are low cost, no heat distortion of mold and outstanding reproduction of detail.

METALLIZING ENGINEERING CO., INC., Long Island City 1, N. Y.

* * *

Cleans Grimy Hands

271 SOLVENT-type hand cleaner, "Khemo-Klean," is rubbed briskly on the hands until it liquefies. It then disperses, penetrates and lifts off embedded dirt and grime from the skin, says the manufacturer.

It does not contain gasoline, ammonia, petroleum, ether or harsh abrasives, says the maker, and will not burn or sting tender and sore skin. The dissolved dirt can be rinsed off with water, or if water isn't available, it can be wiped off with a rag or paper towel.

KHEMO-KLEAN CO., Salt Lake City, Utah.

* * *

Hand-Powered Rolls

272 A CAM-ACTUATED idler roll in a new hand-operated slip roll will form complete circles in 16 gage steel in two passes. Time needed for such an operation is 1/3 less. The roll forms cylinders of 1-in diameter or larger.

Bends can also be located in any position along a sheet of metal being formed because it can be fed through the rolls until the cam lever is engaged. Maximum capacity is ¼-in. round steel bar and ¼-in tubing. The No. 1 roller forms metal up to 6 in. wide; the No. 2 up to 12 in. wide.

O'NEIL-IRWIN MFG. CO., Lake City, Minn.

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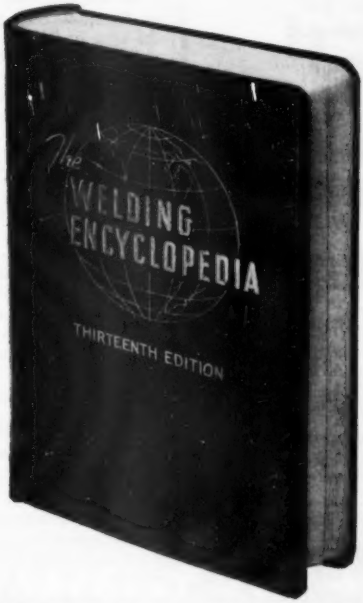

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Coffee-Pot Welder

273 SPECIALLY designed series spot welder joins the spouts to stainless steel coffee pots. Spot spacing, work indexing and electrode operation are all automatically controlled. Two pouring spouts are welded to two pots in one operation.

In addition, two watertight seams of 66 spots each are made around the spot in 20 seconds. External appearance is said to be so clean that little polishing is needed.

On the line, the operator loads two spouts in the lower dies under locator pins which provide location for two coffee pot bodies held down by a double clamp. When the start-button is pushed, the electrodes move through a ¼ in. stroke to make high-speed welds.

Required loading and unloading time is so short that one operator can service three welders. In other words, one operator and three welders can weld 770 spouts per hour.

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New Product Briefs

274 **Stainless** welding wire, rolled edge stainless flat wire, keystone shapes, half-rounds and various other shapes are now available from the plant and warehouse of Pittsburgh Rolling Mills, Inc., Washington, Pa.

• • •

275 **High velocity** air blaster for use in foundries, kilns, pipe bending operations and elsewhere is portable and can be moved by hand or overhead crane. Diameters 18 to 42 in. Chelsea Fan & Blower Co., Inc., Plainfield, N. J.

• • •

276 **Air-operated** bench vises have power ratio of 100:1. Power is afforded by a compact cylinder with an 8-in. bore and two pistons of 50 sq. in. each separated by a removable cylinder head. Van Products Co., Erie, Pa.

• • •

277 **Ready-mixed** aluminum paint called "Super-Hot" becomes permanently bonded to any metal surface upon being subjected to a heat of 500 to 1,600 F. It can be used on furnaces, pipes, boilers and ovens withstanding 1,600 F. The Sheffield Bronze Paint Corp., Cleveland 19.

• • •

To obtain additional information on listed new products, use the cards on pages 17-18.

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From the Patent Office

Welding Nut

2,595,830. Joseph B. Demboske, Berea, O. Assigned to Edward J. Demboske, Berea, O., and Ray E. Demby, Battle Creek, Mich. Filed Sept. 3, 1946. Granted May 6, 1952.

A newly patented welding nut comprises a body having a threaded axial opening in it and an integral rectangular flanged flat base that is thinner than the wall of the body. The lower face of the base has a recess in the center part of it. Ribs protrude from the flat surface. The ribs are tapered towards the perimeter of the flange and towards the recess.

* * *

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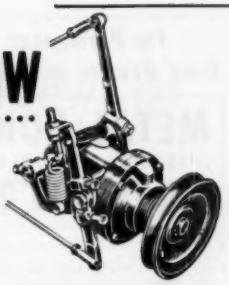

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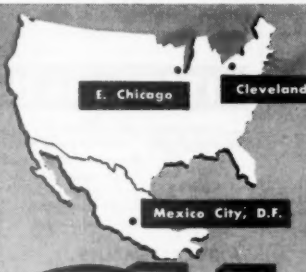

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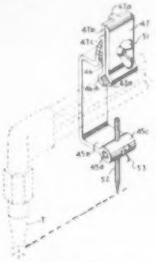
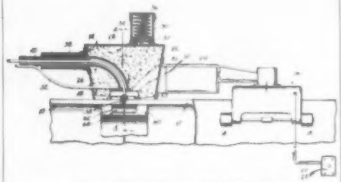
Cutting Torch Attachment

2,596,133. Benjamin H. Donahue and Frank H. Gallimore, Pueblo, Colo. Filed Aug. 16, 1948. Granted May 13, 1952.



Newly patented circle-cutting attachment for oxyacetylene torch consists of a center pin having a body provided with upper and lower offset end parts. The lower offset end part provides means for supporting rotatable and adjustable clamping means. The latter are carried by the upper offset end part and comprise a pair of plate-like members and means engaging the members. The members are adjusted relative to one another for causing them to clamp a tube of the torch structure and to hold the clamp against movement relative to the body. One of the clamping members has heel portions to adapt it for use with tubes having a wide range of diameters.

* * *



Arc Welding Method

2,598,076. Oliver R. Smith, Fort Worth, Tex. Filed July 17, 1950. Granted May 27, 1952.

This patent refers to an arc welding mechanism that includes a flux container positioned above the work. The flux is deposited to cover the welding zone. There are means for supporting the flux container for movement along the weld joint. Electrodes are provided to move through the flux into contact with the work to form a molten deposit of weld metal and flux. Next to the electrodes are means for directing a coolant into contact with the weld deposit to solidify it.

* * *

To obtain additional information on any advertised products use the cards on pages 17-18.

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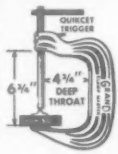
Grand Speed Clamps are quick setting and instant releasing—just push down the screw and tighten with a turn on the vise-type handle. Trigger releases work instantly.



Grand Speed Clamps have extra deep throats—are ruggedly built of NACO No. 6 Steel—spatter proofed.
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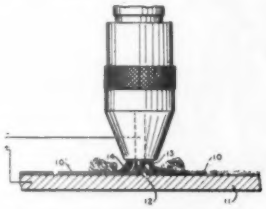
Hammer Blow Tool Company
Wausau 19 H, Wisconsin

Hard-Facing Method

2,592,414. GLENN J. GIBSON, Summit, N. J. Assigned to Air Reduction Co., Inc. Filed Nov. 8, 1947. Granted April 8, 1952.

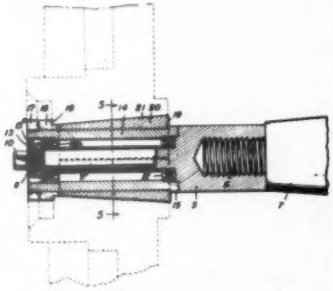


This patent covers a method of hard-facing metal by completely covering its surface with a layer of electrically conductive patricles. The surface consists of at least one carbide from the group of carbides of tantalum, titanium, tungsten, columbium and boron. Method for finishing the surface consists of passing an electric current between a non-consumable electrode and the carbide particles to form a welding arc. The arc and the melted carbide particles are shielded from the air by an inert gas. By moving the gas-shielded arc over the carbide-covered base metal, the carbide particles are progressively fused into a smooth and uniform layer bonded to the basemetal. This is done without substantial oxidation of the carbide or contamination of it by the base metal.

* * *

Grinding Wheel Tester

2,595,777. JOHN F. DRIVER, Fort Wayne, Ind. Filed Jan. 5, 1949. Granted May 6, 1952.



This patent refers to a grinding machine shaft having a stud shaft removably carried on it. The grinding wheel is axially movable from its position on the machine shaft. The stud shaft includes relatively stationary and revoluble parts on the latter of which the grinding wheel is rotatably supported.

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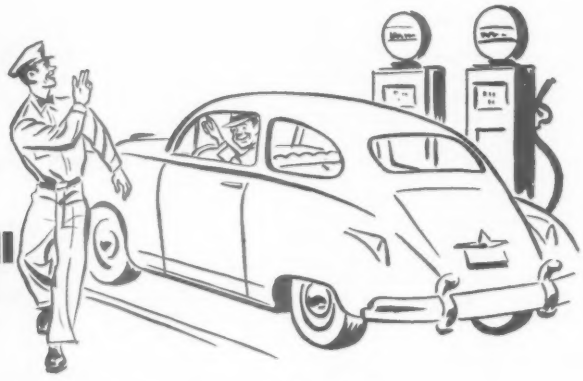
"SEE YOU AT THE POLLS!"

"SEE YOU AT THE POLLS!"

"SEE YOU AT THE POLLS!"



Nobody knows for sure how it started—this line about "See you at the Polls!" we're hearing all over these days.

Best explanation seems to be that it came from that state candidate out west. . . . His opponent in a debate got all riled up and challenged him to fight it out in the alley.

But he said—"I'll settle this the AMERICAN way—I'll see you at the polls!" And the audience picked up the chant.

Now everybody's saying it—and on Nov. 4 everybody will be *doing* it!

"SEE YOU AT THE POLLS!"

"SEE YOU AT THE POLLS!"

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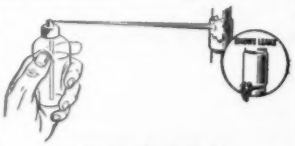

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Introductory LEAK-TEC Set $3.00. Will send on full approval.

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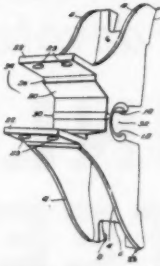
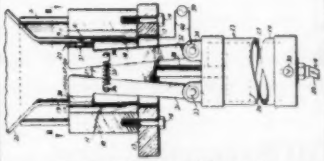
Welded Brake Head

2,593,374. LOREN L. WHITNEY, Hammond, Ind. Assigned to American Steel Foundries, Chicago. Filed June 8, 1948. Granted April 15, 1952.



This patent covers a design of a drop forged and welded brake head. The head comprises top and bottom forgings, each having a front wall with an end lug and intermediate lug. A transvere web extends rearwardly from the intermediate lug. Spaced side walls are connected to the transverse web and to the front wall. Spaced ribs connect each transverse wall to the rear surface of the associated front wall. A keyway runs through each transverse web intermediate the related ribs. The adjacent surfaces of respective webs are formed with semi-sockets defining a hanger socket. The webs are offset rearwardly of the socket to define a brake beam socket. A weld connects the webs between sockets.

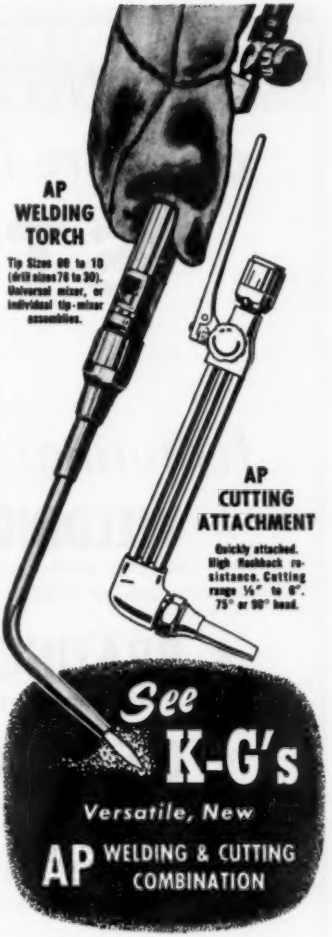
* * *



Spot Welding Method

2,596,453. JOSEPH C. WEIDEL, Bonita, Calif. Assigned to Rohr Aircraft Corp., Chula Vista, Calif. Filed May 18, 1951. Granted May 13, 1952.

A newly patented method of spot welding a large tube to a smaller one consists in advancing the large tube in a tube supporting fixture made of material having large electrical conductance. By advancing the smaller tube into the larger tube, a predetermined overlap of the tubes is obtained. Next an electrically conductive electrode is advanced against the smaller tube in the region of the overlap. An electric current is supplied to the electrode to fuse a part of the tube between the electrode and the supporting fixture. The fused tube material is then compressed.


AP WELDING TORCH
Tip Sizes 00 to 10 (drill sizes 76 to 30). Universal mixer, or individual tip-mixer assemblies.
AP CUTTING ATTACHMENT
Quickly attached. High flashback resistance. Cutting range ⅛" to 6". 75° or 90° head.
See K-G's
Versatile, New
AP WELDING & CUTTING COMBINATION

ALL PURPOSE. Takes a wide variety of tips. Excellent for brazing, welding, heating, cutting. Rugged, efficient, dependable.

ASK YOUR LOCAL K-G DISTRIBUTOR!*

*In Principal Cities

Also M3B Cutting Torches, Pressure Regulators, Complete Outfits, Cutting Machines, Accessories

Catalog on Request

The K-G Equipment Company (Inc.)

Unit of Air Products, Inc.

Dept. A, 1744 Lehigh Street, Allentown, Pa.

COMING IN OCTOBER—
an entire issue devoted to—

STAINLESS STEEL

featuring:

★ **WELDING**—An extensive article which will cover the welding of stainless steel by all processes. This will include arc, gas, inert arc, atomic hydrogen and resistance welding applications of stainless steel.

★ **BRAZING**—An article covering the fabrication of stainless steels using silver brazing alloys.

★ **CLEANING**—This article is devoted to the pre-weld and post-weld cleaning of stainless steels.

★ **FINISHING**—Covering a most important operation, this article will be devoted to the grinding and polishing of welds on stainless steel fabrications.

★ **A big feature of this issue will be a comparable trade name data sheet covering stainless steel electrodes.**

The October issue of THE WELDING ENGINEER will be the Metal Show Number and will cover the Show in its usual full fashion. Program of the Show and the annual meeting of The American Welding Society will be given full play. If you can't get to the Show in Philadelphia, this issue will tell you all about it!

Features like the above can be found only in—

THE WELDING ENGINEER

330 W. 42nd St. New York 36, N. Y.

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MANUFACTURERS REPRESENTATIVES
To Sell special maintenance and repair steel plates and bars in welding supply industry. Must be able to establish exclusive distributors and maintain sales in protected territory. Reply in confidence stating present territory and lines.
RW-4835, Welding Engineer
330 W. 42 St., New York 36, N. Y.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

SELLING OPPORTUNITY OFFERED

WANTED—SALESMAN now calling on welding supply dealers to carry quality line of welder's gloves and safety clothing. Territories Now open. Write Fully—SW-4737, Welding Engineer.

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New General Electric Slope Control. Original price $302.94. Will sell for $150. Taylor's Welding Machine Shop. 134 Crawford St., Van Wert, Ohio.

FOR SALE
$38,000 Inv. Airco Radiagraph Parts
All Models, new.
$10,000 Inv. Welder Parts, Arc, DC,
All Types, new.
6,000 lbs. Welding Flux, Std. Brands
2,000 lbs. Brazing Solder, Cop-Lead
20 Linde Union-Melt Units,
UM & US Models, complete
DETAIL LISTS AVAILABLE. 50% - 75% disc.
APEX CO., 316 N. Ave. 22, Los Angeles, Cal.

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Welding Engineer

330 W. 42nd St., New York 36, N. Y.

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PERFECT CONDITION
500 lbs. minimum orders
Price varying with quantity and destination
CORP BROTHERS
1 Brook Street **Providence 3, R. I.**

WELDING HOSE
Oxygen, acetylene, or air hose, 25' length, ¼" I. D. with couplings—$2.50 per length. Parcel Post Prepaid. Rated firms: net 10 days. Others: Cash with order or C.O.D.
Satisfaction guaranteed.
Other types of hose, prices on request
Saxon Rubber Company
438 Larimer St. **Denver 4, Colo.**

IN 100-LB. LOTS, F.O.B. SCRANTON
SALE OF SURPLUS ELECTRODES
Ampco-Trode, 3/16" #10 Alum. BR....60c-lb.
Arcos, ⅛" Chromang 19/9 MN
Type, 307 Stainless.....40c-lb.
Murex, 5/32" 18/8 MO Stainless.....60c-lb.
Scranton Welding Supply Company
1301 Wyoming Avenue **Scranton, Penna.**

A WELDER BARGAIN
. . . 30 KVA Progressive . . .
Model 24286—220 Volt—60 Cycle 6 Position 21", Geneva Motion Table ELECTRIC BRAKE—MOTOR DRIVEN 12 Station Series Weld, Air controlled Ram 5" CYLINDER.
Write DURAKOOL, INC., ELKHART, IND.

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50-lbs. "131" Nickel Welding Electrodes D.C. For welding pure Nickel and Nickel to Steel. Size 3/16" diam.
15-lbs. "130" X Monel Welding Electrodes For Welding Monel. 1/8" dia.
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WANTED—WELDING RODS
all types and sizes
also, welding equipment
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WELDERS—electric
Please furnish complete description and condition.
ELEC. SALES & ENG. CO.
2209 S. 1st St. **Milwaukee 7, Wis.**

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7,000	1/8"	Page	18-8
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2,000	1/8"	McKay	19-9
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1,000,000 lbs. Surplus Mild Steel Electrodes
WRITE OR WIRE FOR PRICES
INDUSTRIAL AIR PRODUCTS CO.
3200 N. W. Yeon Avenue
Portland 10, Oregon
Ca 9231

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BRONZE, STAINLESS, AMPCOTRODES.
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1200 ft. 5/16" Quaker Single Line Acetylene Hose
1500 ft. 3/16" Gates Twin Oxy-Acet. Hose
150 ft. 1/4" Gates Twin Oxy-Acet. Hose
425 ft. 1/4" Quaker Twin Oxy-Acet. Hose (New Type)
3350 ft. 3/16" Quaker Twin Oxy-Acet. Hose
800 ft. 1/4" Quaker Twin Oxy-Acet. Hose
2400 ft. 5/16" Quaker Twin Oxy-Acet. Hose
36,000 ft. 1/4" & 5/16" Single Oxygen and Acetylene Hose
INDUSTRIAL AIR PRODUCTS CO.
3300 N. W. Yeon Avenue, Portland 10, Oregon

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LIGHTWEIGHT HOLDER

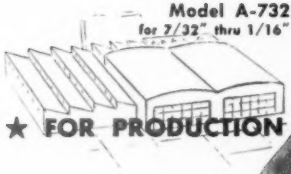
It's New

tough

..light..weighs only 18 ounces

300 AMP. CAPACITY

Model A-732
for 7/32" thru 1/16" rod



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"Super-Mel" is TWECO'S registered trademark name. It designates the only insulation that is internally keyed for strength and fit. "Super-Mel" tip insulators are precision molded with 30 or more layers of glass cloth impregnated with pure melamine resin binder. They withstand excessive heat without breakdown even under abnormal service conditions.

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the Industry

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FEATURING:

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- **Smoother, higher-quality welds!**
- **Safer, quieter operation!**
- **Convenient, sure welding connections!**
- **Peak efficiency always, with ample copper in precision, layer-wound coils!**
- **Rugged Construction throughout assures long life, uninterrupted welding production, minimum maintenance!**

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A. O. Smith Corporation, Dept. WE-852
Welding Products Division, Milwaukee 1, Wis.
International Division, P. O. Box 2023, Milwaukee 1, Wis., U. S. A.

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